DEPARTMENT OF NATIONAL DEFENCE
CANADA

OPERATIONAL RESEARCH DIVISION

DIRECTORATE OF OPERATIONAL RESEARCH (JOINT & LAND)

DOR(J&L) RESEARCH NOTE RN 9913

FORCE PLANNING SCENARIO FRAMEWORK PROOF OF CONCEPT

BY

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OCTOBER 1999

OTTAWA, CANADA

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OTTAWA, ONTARIO

OCTOBER 1999

ABSTRACT

One of the first tasks given to the Strategic Planning Operational Research Team (SPORT), upon its establishment in January 1997, was to lead the effort of the Directorate of Defence Analysis (DDA) to develop a scenario-based capability planning framework. This framework is commonly referred to as the Force Planning Scenario Framework. After consulting with Canada's major Allies, reviewing the literature and exploring possible methodologies, a concept for the framework was specified. A proof of concept trial was undertaken during the Spring of 1999. The status of the Force Planning Scenario Framework and the results of the proof-of-concept trial were reported to the Director General Strategic Planning (DGSP) in a series of two briefings. The first briefing took place on 28 June 1999 and covered the background of the project: the initiating factors, the goals and objectives of the project, the results of the concept exploration and the details of the proposed Framework concept. The second briefing, 14 July 1999, focussed on the results of the proof-of-concept trial and sought endorsement for the proposed way ahead.

This report covers the content of the second briefing given to DGSP, describing the results of the Framework trial. This report will serve as one of the documents recording the history and process of the development of the Force Planning Scenario Framework.

RÉSUMÉ

À sa création en janvier 1997, l'Équipe de recherche opérationnelle en planification stratégique (EROPS) s'est vu confier, comme l'une de ses premières tâches, la direction des travaux du Directeur – Analyse de défense visant à élaborer un cadre de planification des capacités qui se fonde sur les scénarios, connu généralement sous le nom de Structure des scénarios de planification des forces. La définition d'un concept pertinent a fait suite aux consultations tenues auprès des alliés du Canada, après une étude de la documentation et après une exploration des méthodes éventuelles. Un essai de validation de principe a été réalisé au printemps 1999. Le statut de la Structure et les résultats de l'essai de validation de principe ont étés rapporté au Directeur général - Planification stratégique dans une série de deux mises à jour. La première mise à jour a eu lieu sur le 28 juin 1999 et a couvert les travaux d'élaboration du projet : les facteurs qui inaugurent, les buts et les objectifs du projet, les résultats de l'exploration de concept et les détails du concept de Structure proposé. La deuxième mise à jour, fait sur le 14 juillet 1999, a concentré sur les résultats de l'essai de validation de principe et l'approbation cherchée pour la Façon d'avancée proposée.

Ce rapport couvre le contenu de la deuxième mise à jour donné à DGSP, décrire les résultats de l'essai de Structure. Ce rapport servira d'un des documents qui enregistrent l'histoire et le procédé du développement de la Structure de Scénario de Planification de Force.

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FORCE PLANNING SCENARIO FRAMEWORK PROOF-OF-CONCEPT

I – INTRODUCTION

BACKGROUND

1. One of the first tasks given to the Strategic Planning Operational Research Team (SPORT), upon joining the then recently established Directorate of Defence Analysis (DDA) in January 1997, was the development of force planning scenarios and a framework for their analysis to support force planning (Ref.1). This initiative began as a result of a 1994 review of defence planning practices by the Office of the Auditor General (OAG). In that1994 report (Ref. 2), the OAG concluded that there was an inadequate linkage between capability planning and defence policy. The report recommended planning scenarios spanning the spectrum of CF operations be created and incorporated into defence planning, to correct this deficiency. The Department accepted this recommendation and agreed to develop a set of force planning scenarios.

2. Work on this initiative culminated in rudimentary descriptions of four planning scenarios specified in Defence Planning Guidance (DPG) 1997 (Ref. 3). DDA's task was to take this beginning and advance the development of the scenarios to meet the requirements of the Department and the recommendations of the OAG.

3. DDA's first action for this project was to organize a workshop to identify the basic elements to be included in each scenario within the planning set. Participants were invited from each Capability Component and Group Principal within DND. The workshop was held 24 February to 6 March 1997. From the workshop results, a first draft of 11 scenario descriptions was issued in April 1997 (Ref. 4). The conduct of the workshop leading to the specification of 11 force planning scenarios is documented in Reference 5. Since issuing the initial drafts, several iterations of review and modification have transpired. The latest versions of the Scenario Snapshots were described in DPG 2000 (Ref. 6) and are available from DDA.

4. The participants and organizations represented at the workshop remained as the External Working Group (EWG) for scenario development after the conclusion of the workshop. The EWG provides crucial support in developing the scenario descriptions and the concept for the analysis of the scenarios. The support of the EWG will also be crucial in collecting the needed input data to conduct the capability requirements analysis once the scenario framework is completed.

5. Along with the scenario descriptions, work proceeded in parallel to define an analysis framework to support the evaluation of Canadian Forces (CF) capability based upon the force planning scenarios. The general concept for the scenario-based capability planning framework was identified and presented to the Defence Management Committee (DMC) in November 1997. At that meeting, DMC endorsed the concept and approved the proposed way ahead.

6. After much brainstorming and effort examining and evaluating potential analysis tools, a detailed concept for the analysis component of the framework was developed in DDA. The goal in defining the analysis concept for the Force Planning Scenario Framework was to produce a valuable decision support tool for capability planning, as quickly as possible. It was recognized that the concept once implemented would constitute the first version of a constantly evolving and improving system.

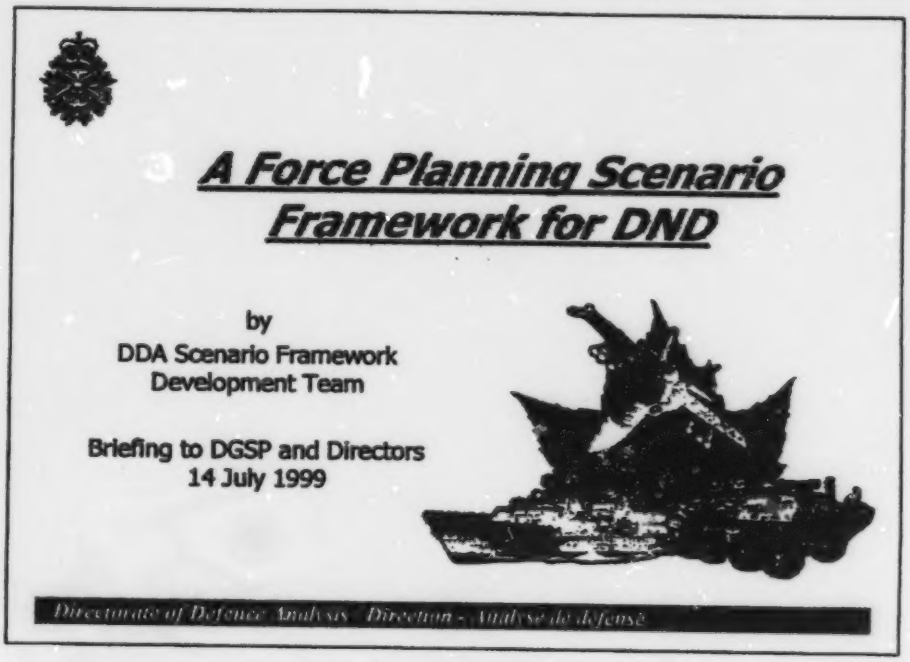
7. A proof-of-concept trial was undertaken to test and evaluate the proposed concept for the Framework before releasing the details to the EWG and Senior Management. The trial was to be completed by the summer of 1999 and the results briefed to DGSP at that time.

8. In preparing for the DGSP briefing, it was decided to conduct two briefings due to the extensive amount of material to be covered. The first briefing would explain the background of the Scenario Framework project, covering the initiation of the project, the development history and the details of the concept. The second briefing would focus on the results of the proof-of-concept trial and the way ahead.

9. The contents of the first presentation on the background and concept of the Force Planning Scenario Framework are documented in Reference 7. This report contains the results of the proof-of-concept trial and recommendations presented to DGSP on 14 July 1999. The report will serve as a record of the history of development of the Force Planning Scenario Framework.

II – PRESENTATION

OPENING REMARKS


A Force Planning Scenario Framework for DND
by
DDA Scenario Framework Development Team
Briefing to DGSP and Directors
14 July 1999
Directorate of Defence Analysis Direction - Analyse de défense

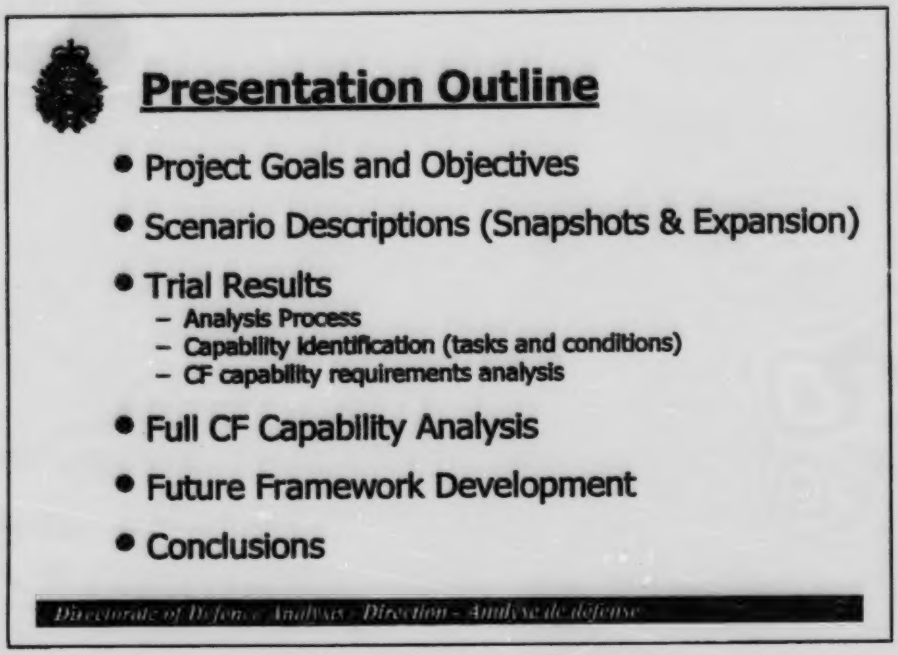
Slide 1 : Title Slide

10. This Force Planning Scenario Framework initiative has truly been a research project that required considerable exploration of possible techniques and options. This work has, from time to time, led us down some dead-ends and sometimes to great results. In all cases we have learnt something for our efforts. We began by examining what our closest Allies were doing with scenarios. We found each nation using scenarios in various ways, but none that lent themselves to solve our problem directly. However, we were able to profit from their experiences as we began our development.

11. A concept has been conceived that goes a long way to meeting our needs. It is not perfect, nor is it the only tool that will be needed to direct force development. It does, however, provide valuable information that can help Senior Management with the Process.

12. On 28 June 1999, a briefing covering the background to the Scenario Framework project was presented. This briefing will report on the results of the DDA Proof-of-Concept Trial and seek endorsement for our proposed way ahead.

PRESENTATION OUTLINE


Presentation Outline
• Project Goals and Objectives
• Scenario Descriptions (Snapshots & Expansion)
• Trial Results
– Analysis Process
– Capability Identification (tasks and conditions)
– CF capability requirements analysis
• Full CF Capability Analysis
• Future Framework Development
• Conclusions
Directorate of Defence Analyses / Direction - Analyse de défense

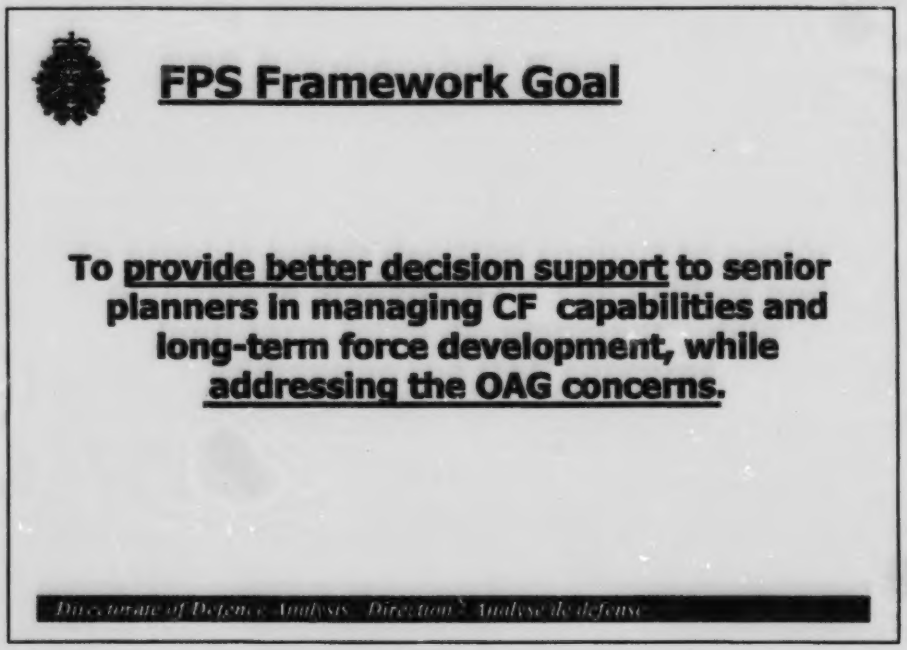
Slide 2 : Presentation Outline

13. In the briefing today, the following aspects of the Project will be covered:

- a quick reminder of the overall goals and objectives,
- the status of the scenario descriptions,
- the results of the Trial, explaining how all the analysis components fit together coherently, the results of capability identification including linking tasks to conditions and the results of the capability requirements analysis,
- an estimate of what will be required to conduct the full Canadian Forces (CF) capability analysis will be explained,

- future enhancements that could be made to the Framework will be identified, and
- finally, conclusions from this effort will be discussed.

PROJECT GOAL

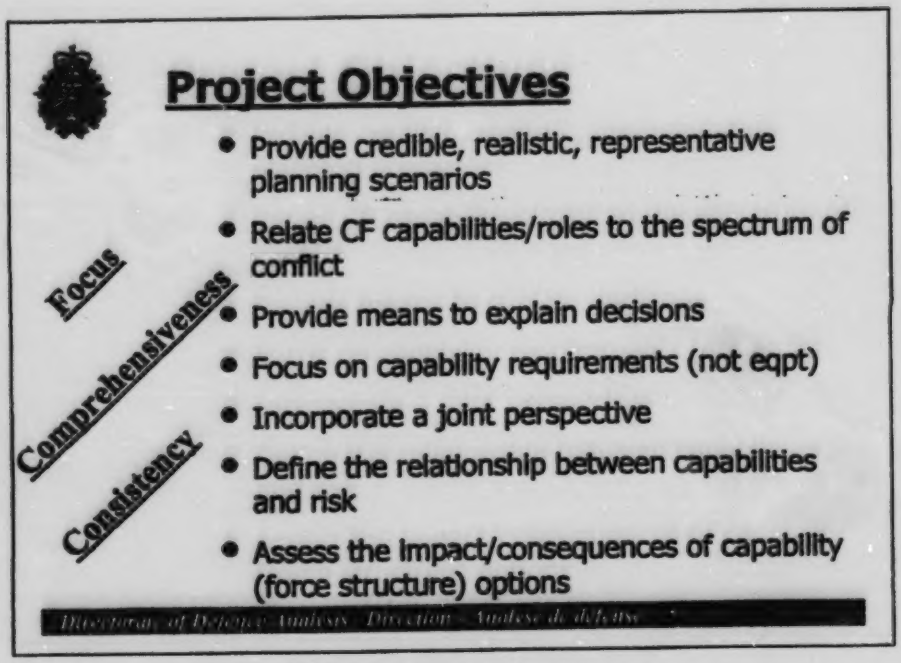

FPS Framework Goal
To provide better decision support to senior planners in managing CF capabilities and long-term force development, while addressing the OAG concerns.
Directorate of Defence Analysis Direction de l'analyse de défense

Slide 3 : FPS Framework Goal

14. This figure shows the goal that the Directorate of Defence Analysis (DDA) set for the project. There are two components that should be emphasized:

- to improve decision support for CF capability management, and
- to satisfy the recommendations of the OAG.

PROJECT OBJECTIVES

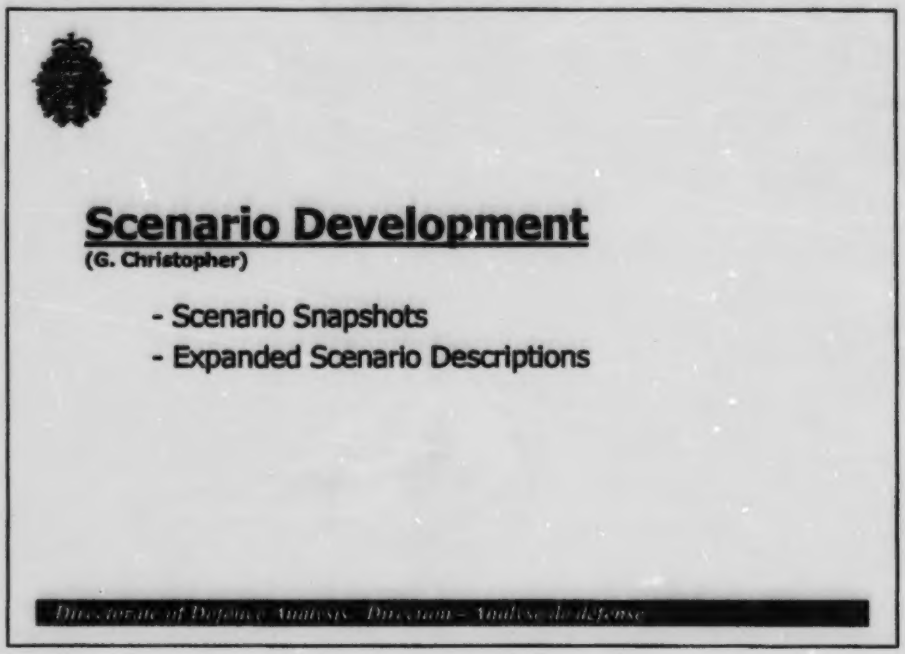

Project Objectives
Provide credible, realistic, representative planning scenarios
Relate CF capabilities/roles to the spectrum of conflict
Provide means to explain decisions
Focus on capability requirements (not eqpt)
Incorporate a joint perspective
Define the relationship between capabilities and risk
Assess the impact/consequences of capability (force structure) options
Focus
Comprehensiveness
Consistency

Slide 4 : Project Objectives

15. These are some of the key objectives that were set for the project. They were discussed in some detail at the June briefing. In essence, the Force Planning Scenario Framework shall:

- provide focus to assessing capability requirements,
- provide a comprehensive approach to allow capability priorities to be examined from a total CF joint perspective, and
- provide consistent input. This will not be the only information required by decision makers but they should be able to count on this input when dealing with capability issues.

SCENARIO DESCRIPTION DEVELOPMENT

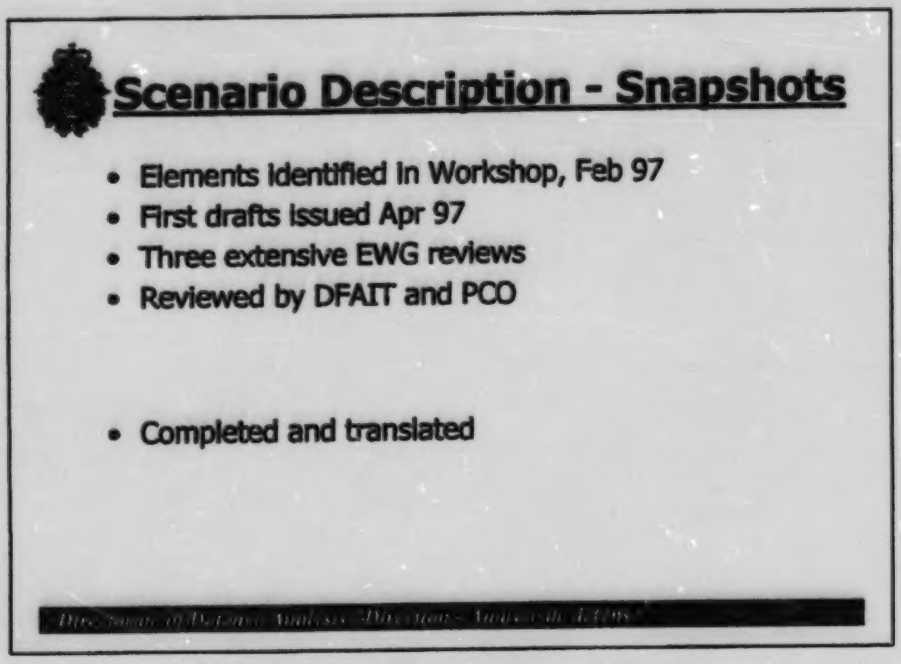

Scenario Development
(G. Christopher)
- Scenario Snapshots
- Expanded Scenario Descriptions
Directorate of Defence Analysis - Direction - Analyse de la défense

Slide 5 : Scenario Description Development

16. The briefing will now move on to describe the status and Way Ahead for the development of the Scenario Snapshots and the Expanded Scenario Descriptions. The Snapshots are the concise descriptions of the situations that would lead to the employment of the CF. They are unclassified and are intended to be publicly available.

17. The expanded descriptions contain all the operational information required to conduct a detailed capability requirements assessment.

SCENARIO SNAPSHOT DESCRIPTIONS


Scenario Description - Snapshots
• Elements identified in Workshop, Feb 97
• First drafts issued Apr 97
• Three extensive EWG reviews
• Reviewed by DFAIT and PCO
• Completed and translated

Slide 6 : Scenario Description - Snapshots

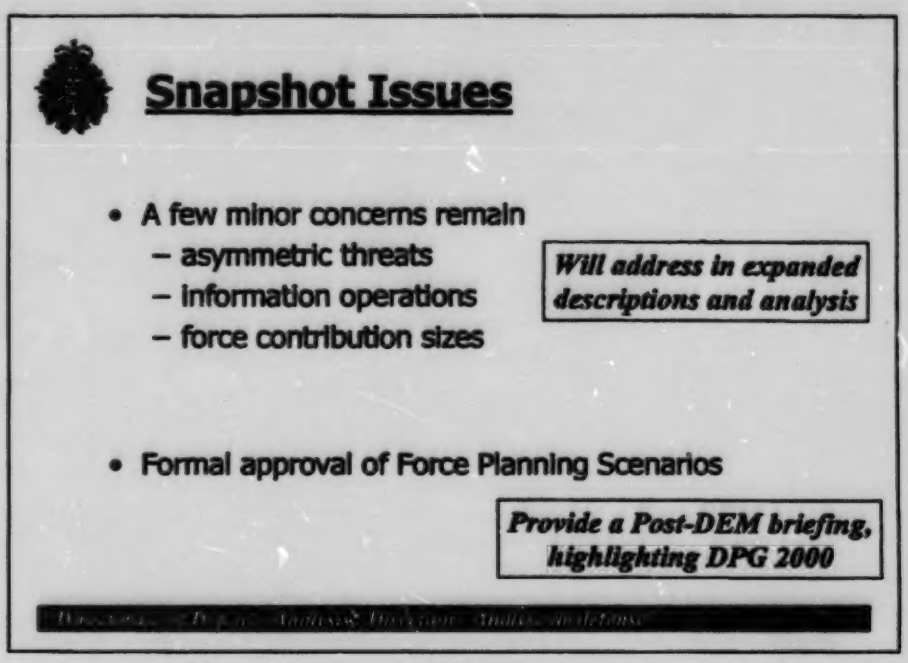
18. The essential elements for the Snapshots were first identified in a two-week workshop organized by DDA in February 1997. DDA then developed drafts of the Snapshot descriptions and circulated them to the External Working Group, former Workshop participants, for review in April 1997. Several concerns required significant modifications to some of the Snapshots, subsequently leading to additional reviews.

19. To date there have been three extensive reviews by the EWG, the Department of Foreign Affairs and International Trade (DFAIT) has examined them and the Privy Council Office has also scrutinized them.

20. No serious issues remain outstanding.

21. The Snapshots have been endorsed and issued as a component of the Defence Planning Guidance (DPG 2000).

ISSUES WITH SNAPSHOTS


Snapshot Issues
• A few minor concerns remain
– asymmetric threats
– information operations
– force contribution sizes
Will address in expanded descriptions and analysis
• Formal approval of Force Planning Scenarios
Provide a Post-DEM briefing, highlighting DPG 2000

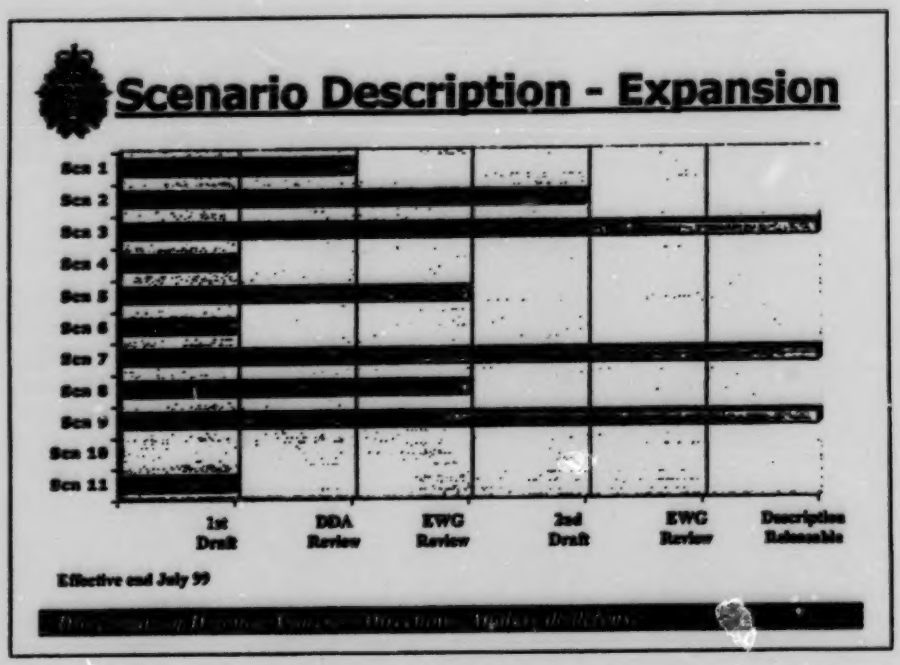
Slide 7 : Snapshot Issues

22. While there are no serious issues remaining, there are a few minor ones. There are a few concerns about specific information dealing with asymmetric threats and information operations not being given adequate emphasis in the Snapshots. And the Policy group would like to see representative CF contributions specified in the Snapshots.

23. In both cases, it is felt that such details are unnecessary or undesirable for the Snapshot descriptions. They will be dealt with in detail in the expanded scenario (operational) descriptions and in the scenario analysis.

24. There is also the issue of "formally" recognizing the Snapshots as ready for force planning use. DDA proposes a Post-DEM (Daily Executive Meeting) briefing to make Senior management aware of the state of development of the Scenario Framework. It would also be pointed out in this briefing that the Force Planning Scenarios set were described in DPG 2000 and endorsed for force planning with the approval of that document.

SCENARIO DESCRIPTION EXPANSION



Slide 8 : Scenario Description Expansion

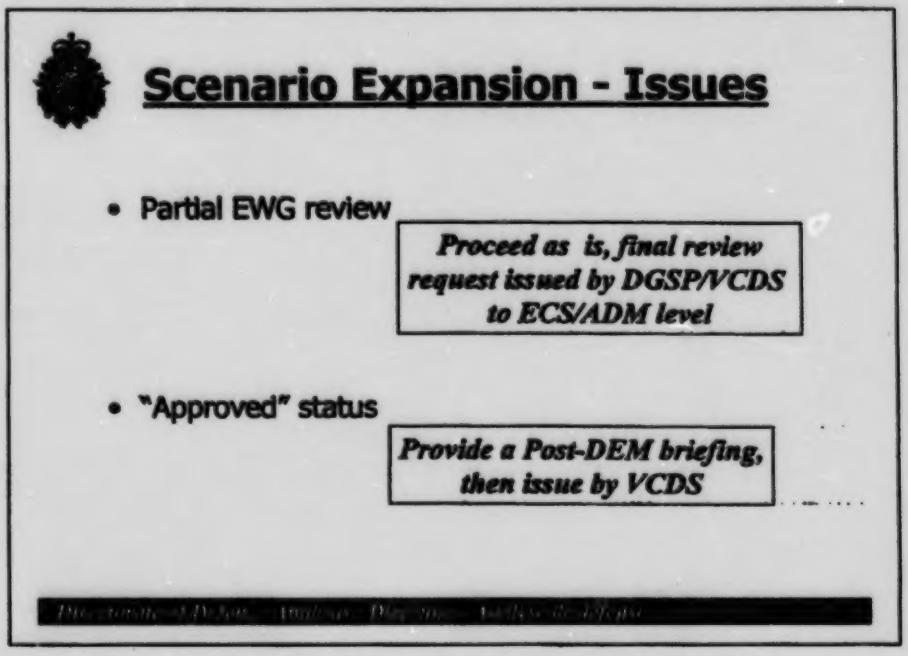
25. The process used to develop the operational descriptions of the Scenarios started with an initial draft developed under contract (by a Royal Military College professor). This draft would be refined by DDA then issued to the EWG for review. A second draft would be produced to address EWG comments. If extensive changes were made a second EWG review could be undertaken. With the final adjustments made, the Expanded Scenario Description would then be releasable.

26. The DDA review takes about two weeks, the EWG review adds two weeks, production of the second draft requires a week. At the end of this, the Expanded Scenario Description is ready for issue for force planning application.

27. The Figure shows the state of all the expanded descriptions as of the end of July. Several are ready for issue, several are nearing that state, a few have initial drafts developed and one scenario has yet to be started. Because of the complex aspects of Scenario 10, Defence of Canada/US territory, it has been left for internal development. DDA will focus on this scenario after the summer leave period.

28. While many of the scenarios are in various stages of development, they are "analyzable" after the DDA review. The results is that the majority of Scenarios are ready for analysis now and the others soon will be.

ISSUES REMAINING WITH SCENARIO EXPANSION


Scenario Expansion - Issues
• Partial EWG review
Proceed as is, final review request issued by DGSP/VCDS to ECS/ADM level
• "Approved" status
Provide a Post-DEM briefing, then issue by VCDS

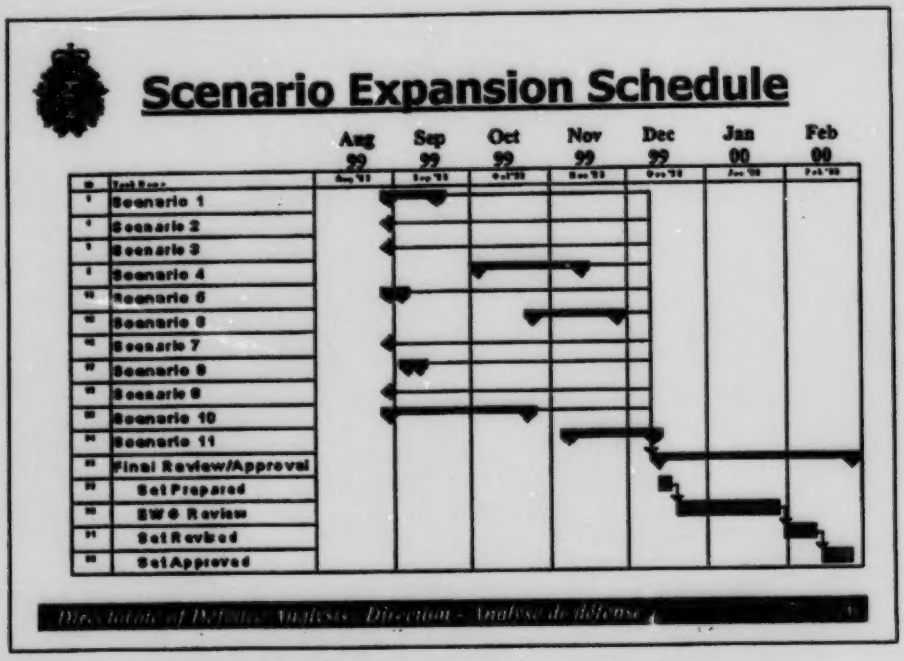
Slide 9 : Scenario Expansion - Issues

29. There are a couple of issues remaining with the development of the Expanded Scenario Descriptions. First, although DDA has been distributing the drafts for review to everyone in the EWG, since the Kosovo operation started, only half of the EWG members have provided comments. Key players such as the Joint Staff and the Maritime Staff have not participated. Their input is required to finalize the scenario descriptions.

30. To address this it is proposed that DDA continue with the development as in the past. Then once all the descriptions have been reviewed, they can be issued from the Vice Chief of Defence Staff to the senior level in each organization to provide one last opportunity to provide comments before the expanded descriptions are issued for analysis.

31. The other remaining issue is to give the Expanded Descriptions some official status as ready for force development employment. It is proposed that the VCDS issue the Expanded Scenario Descriptions, when ready, with some direction for their use in force planning. This intention could also be discussed in the Post-DEM briefing.

SCENARIO EXPANSION SCHEDULE



Slide 10 : Scenario Expansion - Schedule

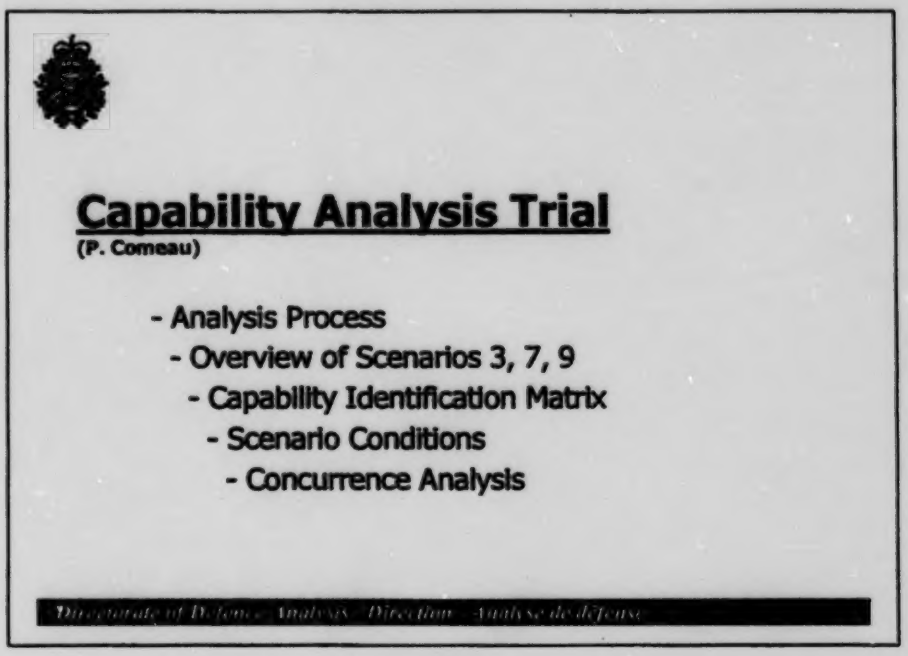
32. This Figure displays the schedule to complete the initial development of the Expanded Scenario Descriptions, utilizing the same process and resources as has been utilized to this point in time. The schedule assumes no impact will occur from Y2K. If the Y2K crisis does occur with a resulting impact on DDA and EWG resources, timelines will shift to the right.

33. It can be seen that DDA will focus on Scenario 10 immediately after the summer leave period and will push earnestly to advance it.

34. Although the scenarios will be able to support analysis in the mid-Fall timeframe, DDA expects the second draft of all the scenarios to be available towards the end of the calendar year.

35. The final high-level EWG review could be initiated before or right after Christmas and completed by late February 2000, assuming minimal Y2K interference. At this point, the VCDS could formally issue the Expanded Scenario Descriptions.

PROOF-OF-CONCEPT TRIAL

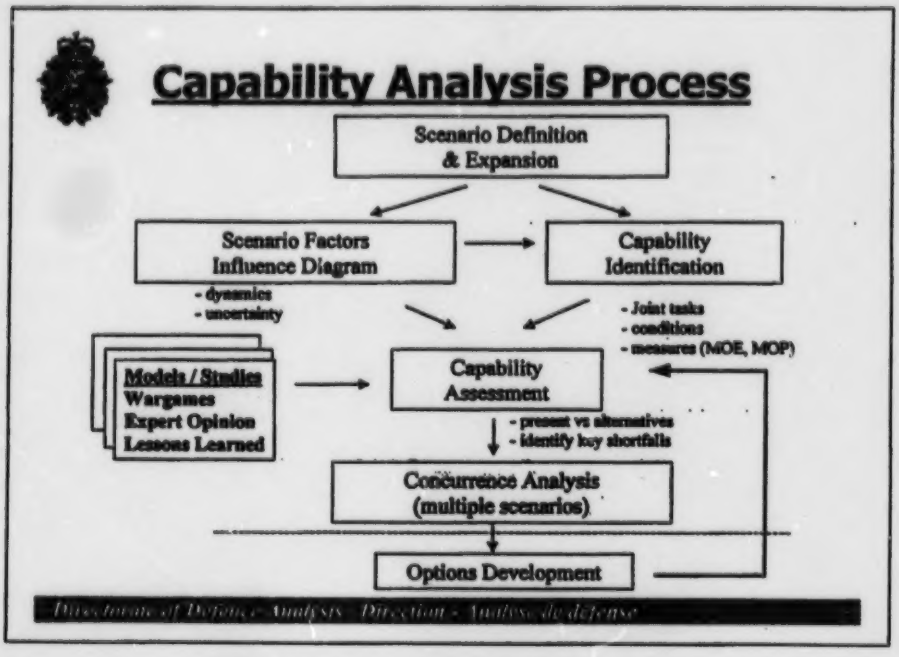


Slide 11 : Capability Analysis Trial

36. The focus will now shift to describing some results of the capability analysis Proof-of-Concept Trial that was carried out by the DDA team using Scenarios 3, 7, and 9.

37. In this section, The process used will be described, a quick overview of sample scenarios used will be provided, the resulting capability matrix will be shown and the conditions encountered in the test scenarios will be discussed. Finally, the data required and results of the scenario concurrence analysis for one of the capability components will be explained.

CAPABILITY ANALYSIS PROCESS



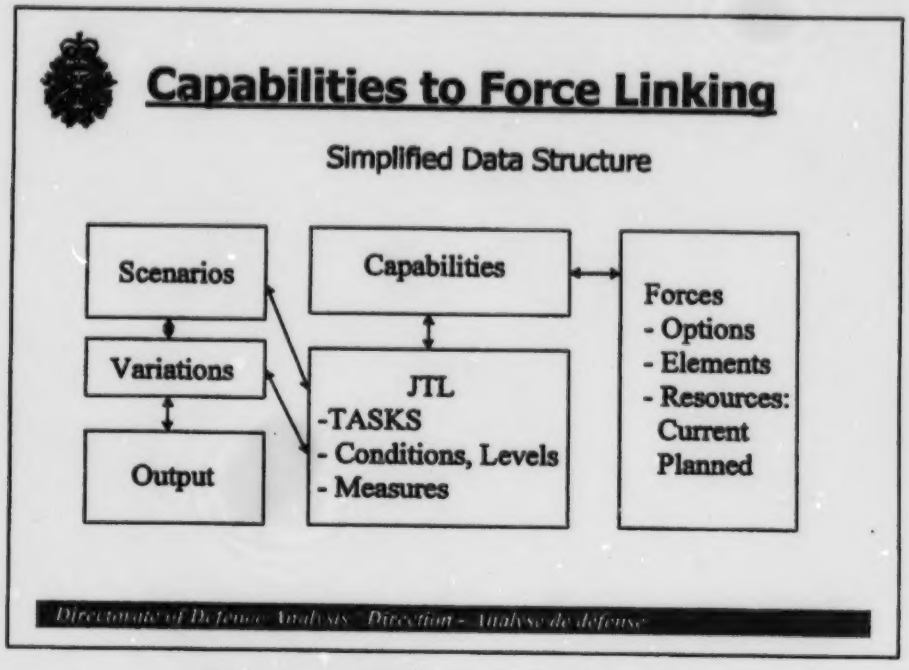
Slide 12 : Capability Analysis Process

38. Using each of three defined and expanded Force Planning Scenarios, military capabilities required by a notional coalition force were identified. An assessment was then made as to the possible CF contributions to each scenario. In each case high and low contributions were postulated. It is acknowledged that each scenario could be analyzed in more detail but representative data were developed. A substantive effort will be required to develop a fully validated data set.

39. After each scenario was examined individually, the team looked at the concurrence implications of multiple scenario demands on capability by producing a risk profile (probability that there is enough capability available from a stated fixed desired level).

40. In the end, the results of this analysis could be used to develop options, which could then be fed back into the process to assess the new balance of capabilities which could be or should be maintained by the CF.

LINKING CAPABILITIES TO FORCES

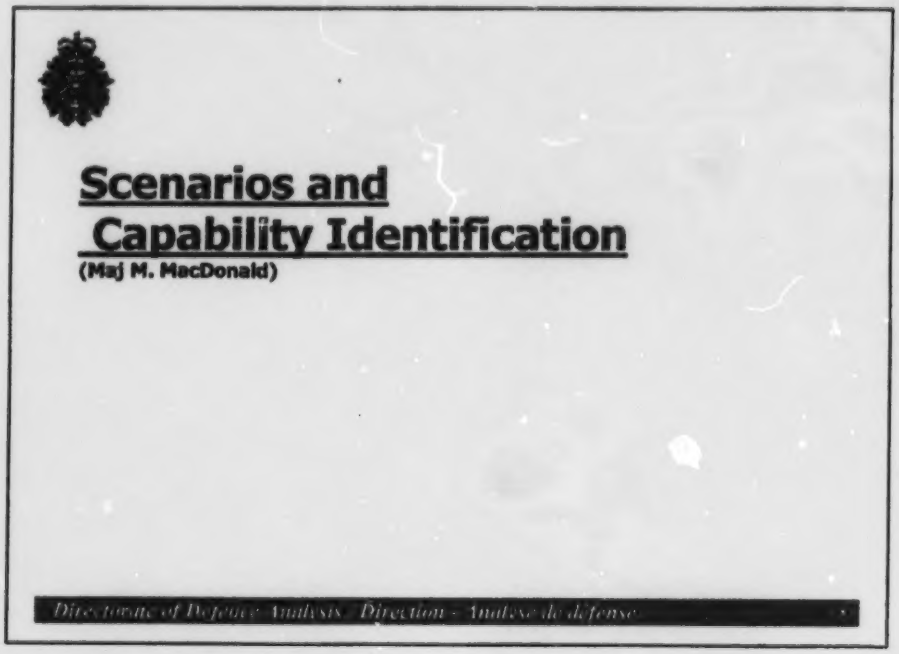


Slide 13 : Capabilities To Force Linking

41. This chart shows a simplified representation of the scenario-to-capability-to-force element linkage. Each Force Planning Scenario can manifest itself in one of many variations. Each variation may call up different levels of capability. A link has been made between capabilities required (the demand side) and capabilities available (the supply side) from force generators.

42. Specific examples of tasks and conditions, which were used to express capabilities, will be shown later.

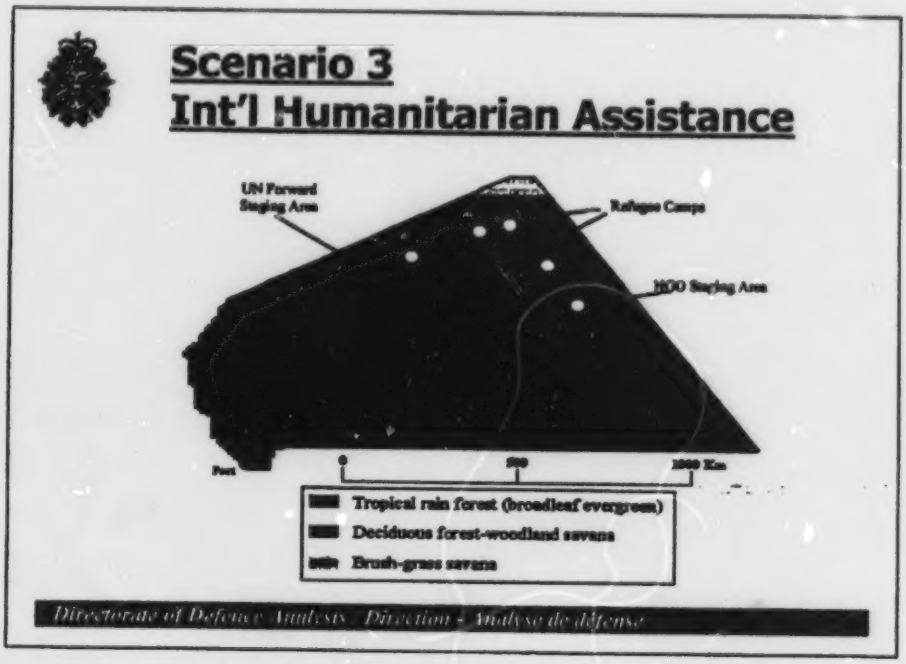
SCENARIO AND CAPABILITY IDENTIFICATION SECTION


Scenarios and
Capability Identification
(Maj M. MacDonald)
Directorate of Defence Analysis / Direction - Analyse de défense

Slide 14 : Scenario And Capability Identification Section

43. The details of the input data will now be described. The nature of the three scenarios will be explained, along with the capability identification matrix produced from the scenario analysis.

SCENARIO 3 – INTERNATIONAL HUMANITARIAN ASSISTANCE



Slide 15 : Scenario 3 – International Humanitarian Assistance

44. Scenario 3 represents an International Humanitarian Assistance Operation. A drought situation has arisen in a Central African country that has placed a large number of lives at risk. The magnitude of the situation has completely overwhelmed local government, infrastructure and support facilities. The country involved has asked for international help in the form of humanitarian assistance to relieve human suffering and stop loss of life.

45. Non-Government Organizations (NGOs) are already deployed, but are also overwhelmed. The United Nations (UN) assessed the situation and has passed a resolution calling for the formation of a multinational force, with a 6-month mandate, that will:

a. assist in the delivery of humanitarian supplies by sea and air to several staging areas for subsequent distribution by local authorities and NGOs, and

b. provide support services for local government authorities and NGOs at the staging areas.

46. As part of an international force, elements of the CF are to assist in the distribution of humanitarian aid supplies to the staging areas situation until the local authorities and NGOs once more can effectively deal with the situation.

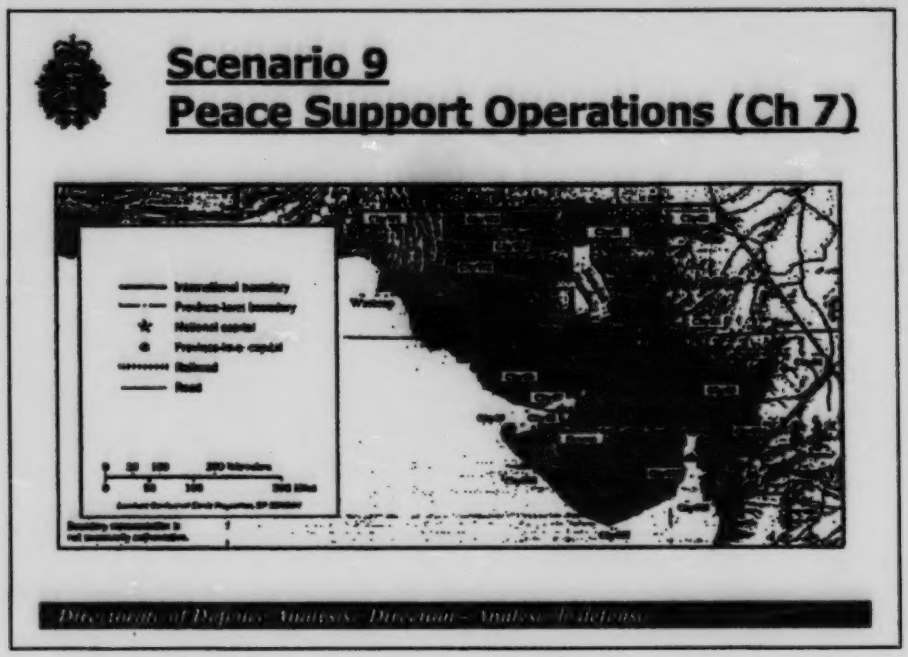
SCENARIO 7 - AID OF CIVIL POWER

Slide 16 : Scenario 7 - Aid Of Civil Power

47. Scenario 7 explores a CF aid to the Civil Power mission. Canada has been suffering through several years of drought and water rationing has been enforced in the western part of the country. Minor disputes over access to water have become more and more commonplace, pitting individual against individual and individual against industry. As water has grown more and more scarce, the groups involved in disputes have had time to become organized. The affected region has expanded to include the jurisdiction of two provinces. In at least one case a minor dispute has escalated creating large-scale unrest, including armed insurrections. The situation has reached a point where civilian authorities can no longer cope, and military assistance has been requested under Part XI of the National Defence Act.

48. The mission of the CF is to assist the civil authorities in restoring law and order.

SCENARIO 9 – PEACE SUPPORT OPERATIONS (CHAPTER 7)



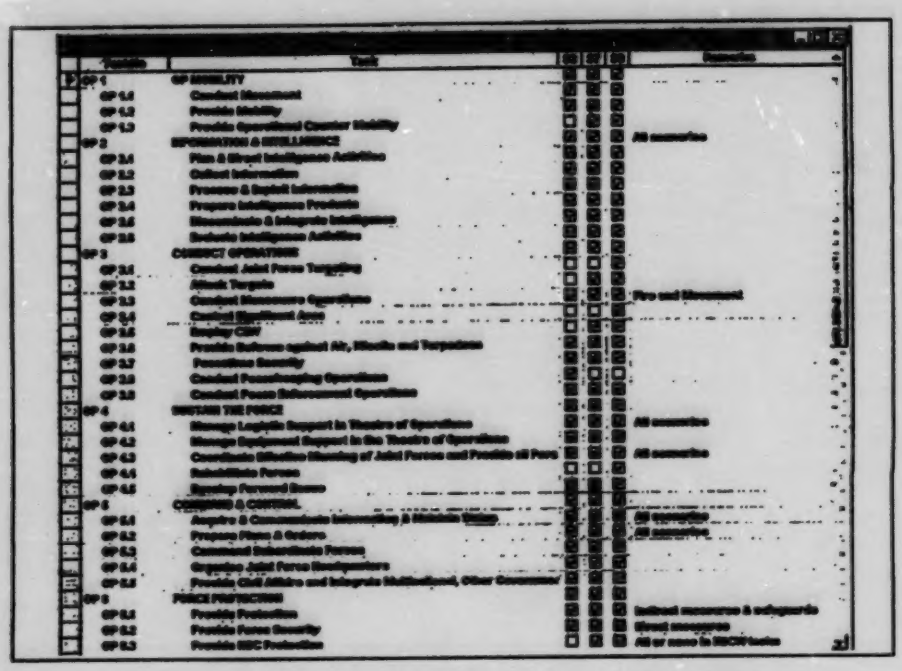
Slide 17 : Scenario 9 – Peace Support Operations (Chapter 7)

49. Tension over a disputed area along the border between two non-NATO states has escalated to include armed conflict. One state has invaded the other and is occupying the disputed area. This state is likely to attain an overwhelming victory over its opponent. The international community has assessed that this would be unacceptable. This led to a resolution by the UN Security Council that a multinational force under UN command be formed and deployed to restore the previous situation and re-establish the internationally recognized border. A coalition force is being established under Chapter 7 of the UN Charter. Canada has agreed to deploy maritime, land and air force personnel abroad.

50. The Government recognizes that there will likely be combat casualties and authorized initiation of Mobilization Stage 3, but it has reserved its position on replacing significant combat losses. Part 3 of the Emergencies Act has been proclaimed and regulations under Section 30 have been approved – including the authority to requisition commercial transportation services.

51. As part of a coalition of like-minded nations formed under the auspices of Chapter 7 of the UN Charter, elements of the CF are to conduct operations to restore the pre-conflict boundaries as well as enforce a naval embargo and a no flight zone.

JOINT TASK LIST CAPABILITY IDENTIFICATION



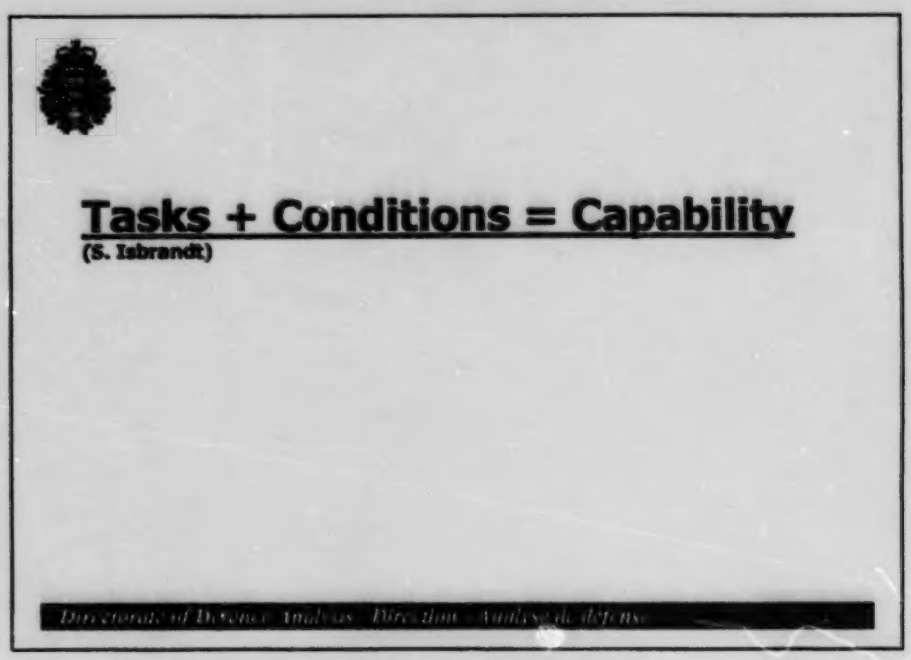
Slide 18 : Joint Task List Employed In The Trial

52. The background briefing on the Scenario Framework project introduced the Universal Joint Task List (UJTL) developed by the United States (US) and the proposal to use the United Kingdom version for CF capability identification. This Figure shows the result of analysis to identify operational tasks relevant to Scenarios 3, 7 and 9 as part of the trial. A similar table was produced for strategic level tasks. All three scenarios require operational mobility, information and intelligence, and command and control. The specific requirements can be documented in lower levels of the capability hierarchy.

53. In the conduct of operations, there are no targets being attacked in Scenario 3. Humanitarian and peacekeeping operations are being carried out in this case. Force protection is relevant in all three scenarios, although a NBC (nuclear, biological and/or chemical) threat is not anticipated in Scenario 3.

54. These military coalition task (capability) requirements, as identified through the Joint Task List, must be translated into possible yet consistent contribution options for Canada. This capability identification exercise requires a good grasp of the capability structure and the scenarios. In order to describe fully the capabilities required, the conditions, under which these tasks must be performed, must be specified.

TASKS AND CONDITIONS

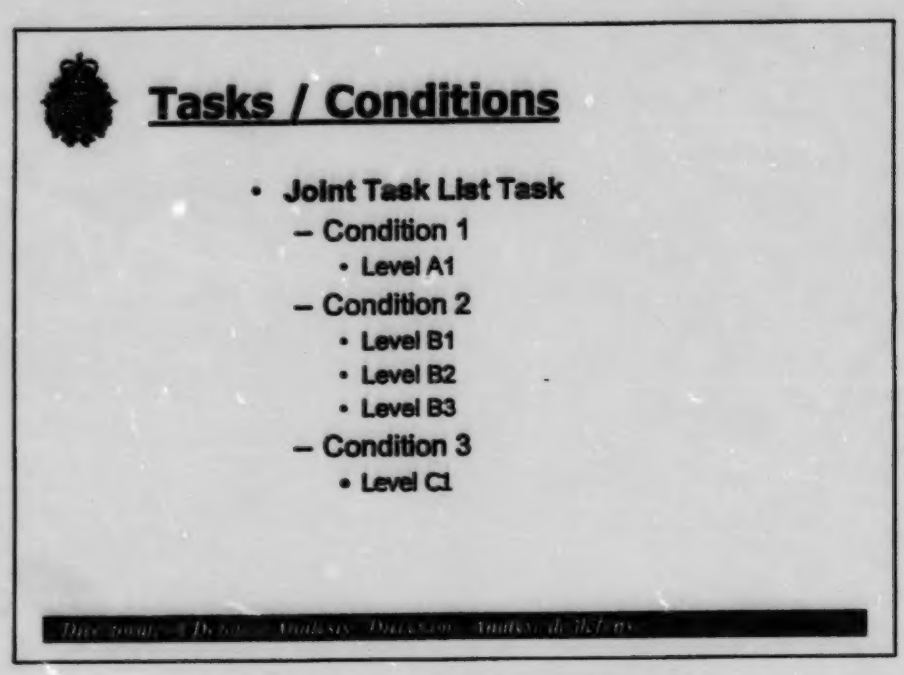


Slide 19 : Task And Conditions

55. The definition proposed for use in describing military capabilities from a non-equipment, conceptual perspective is that a capability is the achievement of an effect or event in the area of operations under a specified set of conditions. In other words, tasks plus conditions equals capabilities.

56. This portion of the briefing will explain an approach to link conditions with tasks specified in the Joint Task List.

TASKS-CONDITIONS RELATIONSHIP

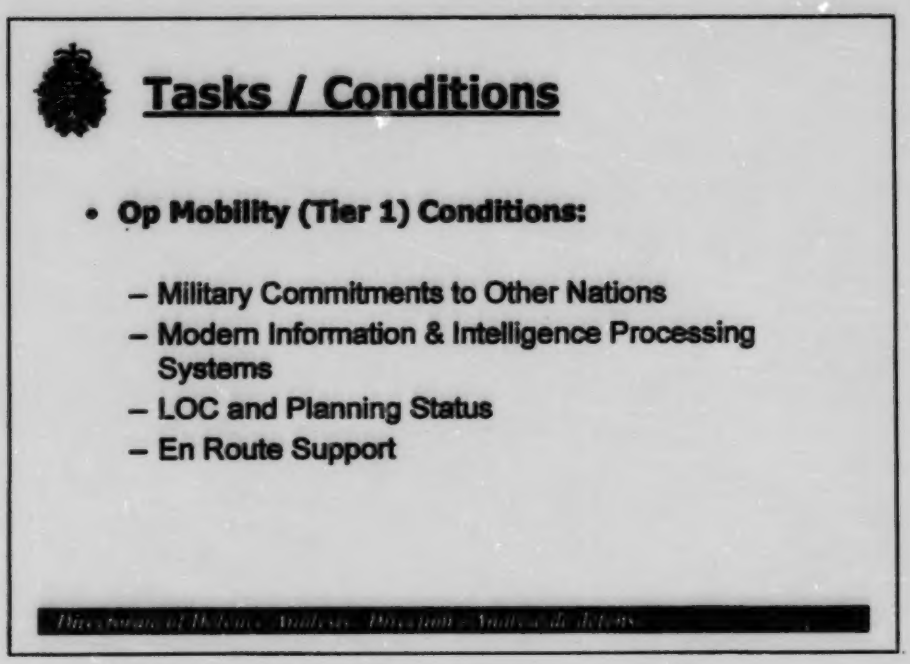


Slide 20 : Tasks-Conditions Relationship

57. Each task in the Joint Task List (JTL) has from a few to many conditions which are used to further describe the nature of the task. This description is accomplished by assigning one or more levels to each task condition.

58. DDA's first attempt to link conditions with each task has been generated by matching our current JTL (based on the UKJTL) with the closest task in the original US UJTL, and using conditions and levels already specified in the US UJTL. The end result still needs some refinement in order to customize it for the CF JTL, but it is a good starting point.

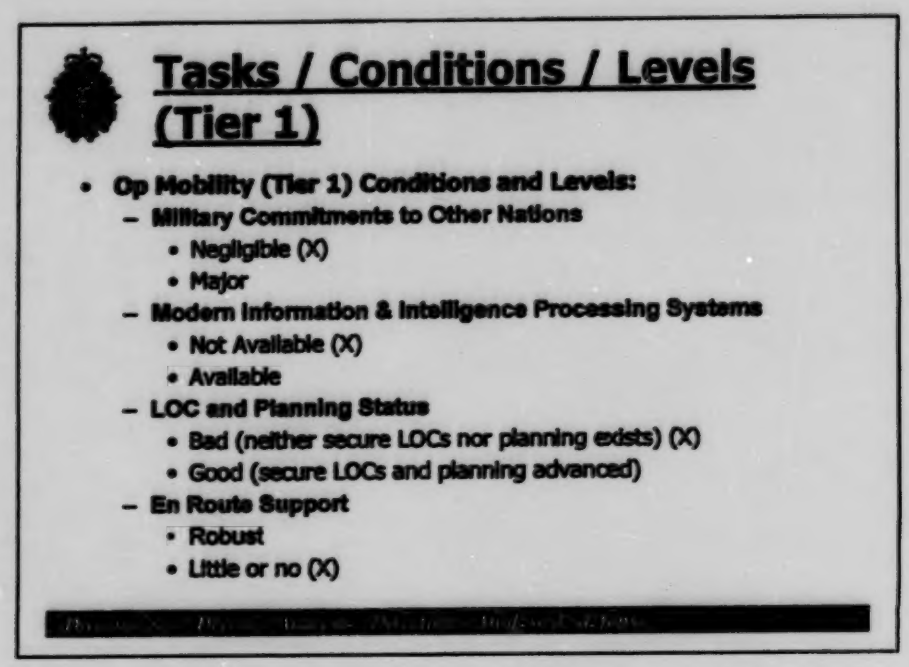
TIER 1 CONDITIONS


Tasks / Conditions
• Op Mobility (Tier 1) Conditions:
– Military Commitments to Other Nations
– Modern Information & Intelligence Processing Systems
– LOC and Planning Status
– En Route Support

Slide 21 : Example Of Tier 1 Conditions

59. In Scenario 3, there are twelve tasks identified from the Joint Task List, which occupy the top tier. This Figure shows one of them, Operational Mobility, along with the four conditions linked to it in the JTL.

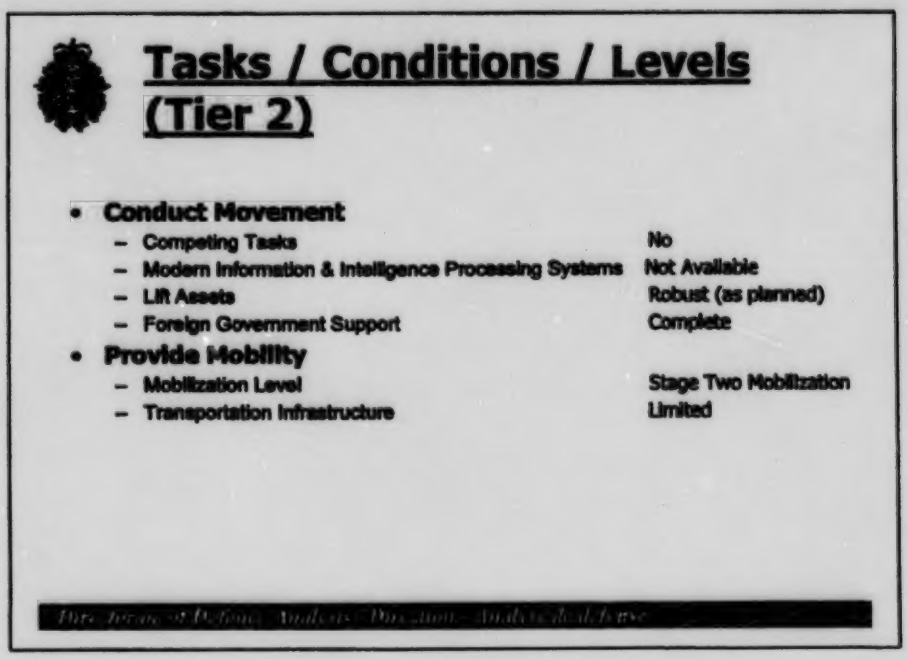
TIER 1 CONDITIONS AND RATINGS


Tasks / Conditions / Levels (Tier 1)
• Op Mobility (Tier 1) Conditions and Levels:
– Military Commitments to Other Nations
• Negligible (X)
• Major
– Modern Information & Intelligence Processing Systems
• Not Available (X)
• Available
– LOC and Planning Status
• Bad (neither secure LOCs nor planning exists) (X)
• Good (secure LOCs and planning advanced)
– En Route Support
• Robust
• Little or no (X)

Slide 22 : Conditions/Levels/Ratings (Tier1)

60. Each of these conditions has level descriptors which describe in some way a quantity, class, or intensity rating value for the condition. The levels appropriate to each condition for Scenario 3 are indicated in the Figure with a (X).

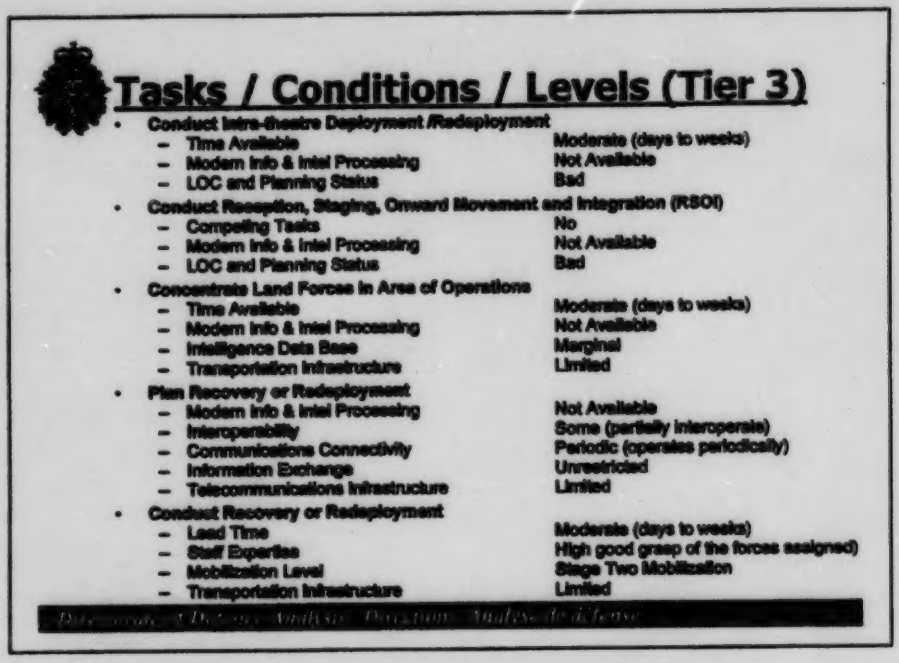
TIER 2 CONDITIONS AND RATINGS



Slide 23 : Conditions/Levels/Ratings (Tier2)

61. At Tier 2 of the JTL, Operational Mobility splits into two sub-tasks: "Conduct Movement", and "Provide Mobility". Each of these tasks, in turn, has associated conditions and levels that describe those conditions. Only the applicable level for Scenario 3 is shown in the Figure, instead of all the levels possible.

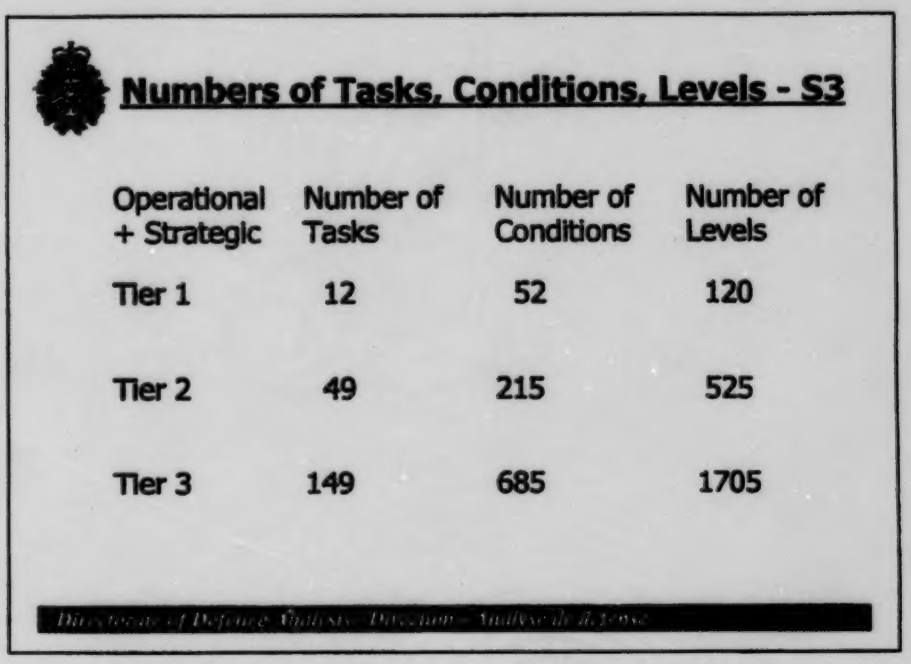
TIER 3 CONDITIONS AND RATINGS


Tasks / Conditions / Levels (Tier 3)
Conduct Intra-theatre Deployment /Redeployment
– Time Available — Moderate (days to weeks)
– Modern Info & Intel Processing — Not Available
– LOC and Planning Status — Bad
Conduct Reception, Staging, Onward Movement and Integration (RSOI)
– Competing Tasks — No
– Modern Info & Intel Processing — Not Available
– LOC and Planning Status — Bad
Concentrate Land Forces in Area of Operations
– Time Available — Moderate (days to weeks)
– Modern Info & Intel Processing — Not Available
– Intelligence Data Base — Marginal
– Transportation Infrastructure — Limited
Plan Recovery or Redeployment
– Modern Info & Intel Processing — Not Available
– Interoperability — Some (partially interoperate)
– Communications Connectivity — Periodic (operates periodically)
– Information Exchange — Unrestricted
– Telecommunications Infrastructure — Limited
Conduct Recovery or Redeployment
– Lead Time — Moderate (days to weeks)
– Staff Expertise — High good grasp of the forces assigned)
– Mobilization Level — Stage Two Mobilization
– Transportation Infrastructure — Limited

Slide 24 : Conditions/Levels/Ratings (Tier3)

62. At Tier 3, the Tier 2 Tasks now split into 5 sub-tasks, with a total of 19 conditions. The JTL can be specified down to Tier 4, even more detail than this. However, it is felt that for most situations, working at Tier 3, or when appropriate Tier 2, would provide sufficient detail for analysis purposes.

TASKS, CONDITIONS AND LEVELS APPLICABLE TO SCENARIO 3

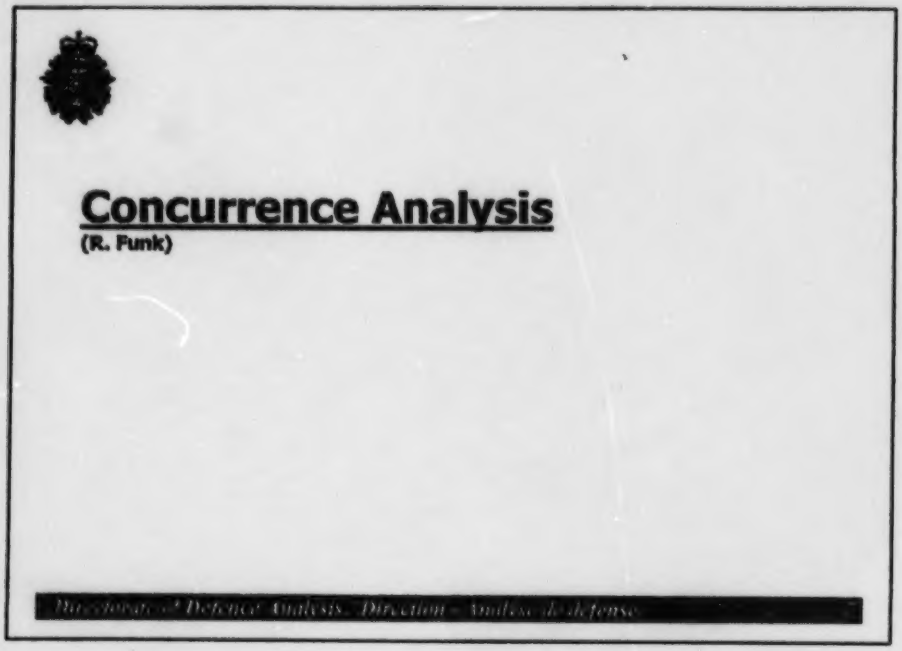


Slide 25 : Number Of Tasks, Conditions And Levels In Scenario 3

63. This Figure gives an idea of the numerical complexity of conditions and levels as one goes to more detail from Tier 1 down to Tier 3, using Scenario 3 as an example. For Tier 1, for example, there are 12 tasks in the JTL, resulting in 52 Task/Condition pairs to evaluate, with up to 120 Task/Condition/Level triples to consider. As you go to Tier 3, the numbers get correspondingly larger.

64. This numeric explosion of data is typical of what would be encountered in the other scenarios as well. If the analysis were to go down to Tier 4, a tremendous amount of information would have to be determined and managed in order to carry out an analysis.

CONCURRENCE ANALYSIS



Slide 26 : Concurrence Analysis

65. The concurrence analysis component of the Trial was conducted with the Scenario Operational Capability Risk Assessment Model (SOCRAM) during May to July 1999. The data that will be presented were selected to illustrate how the analysis factors can interact and in no way represent any definitive results.

66. SOCRAM is based on several of the underlying analysis principles first implemented in the Air Force Operational Personnel Risk Assessment Model (OPRAM). The key aspects carried over from OPRAM to SOCRAM are:

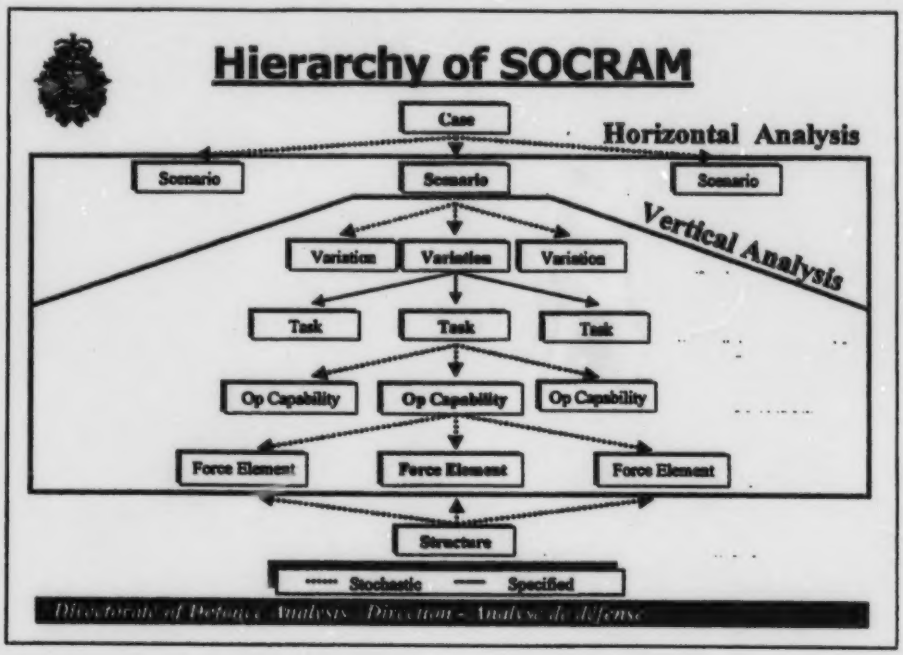
a. A method of articulating and activating scenario interactions that is methodologically sound and recognises the practical limitations of the available data.

b. The model is based on analysis principles which focus on capturing a set of practical business rules and articulating them within a sensible conceptual framework that is logical to the strategic planning staffs. The intent is to

avoid, to the extent possible, the imposition of any new conceptual constructs on top of an already confusing situation.

c. Risk is assessed as the percentage of time that a given level of demand is exceeded. The data come from evidence accumulated through a systematic simulation of scenario interactions.

SOCRAM STRUCTURE



Slide 27 : Hierarchy Of SOCRAM

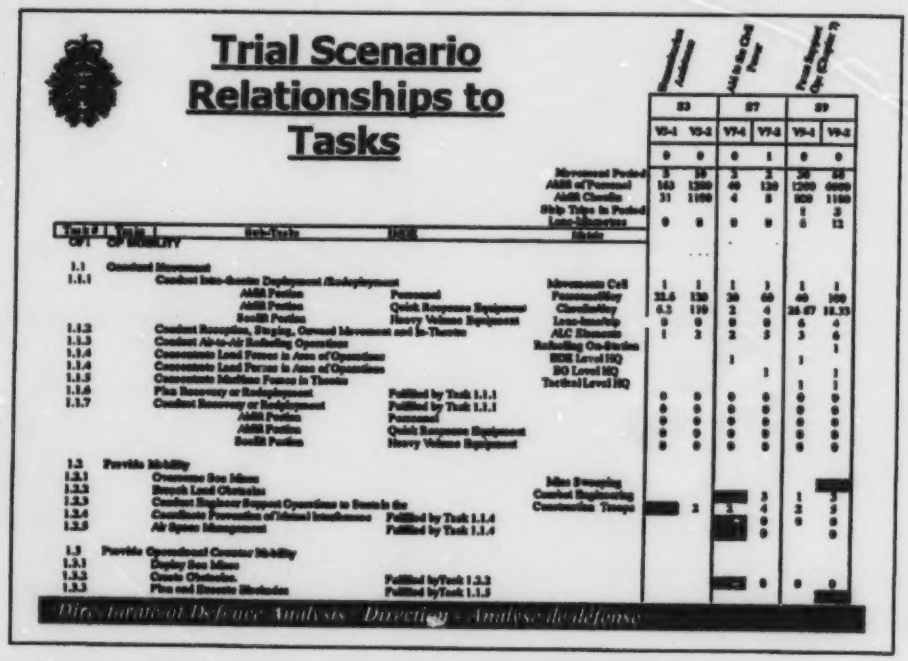
67. The easiest way to explain SOCRAM relationships is through a hierarchical view that articulates where the theoretical concepts are translated into more practical constructs. The terminology in SOCRAM may appear convoluted at first glance but is actually quite logical.

68. The most significant aspect of the vertical analysis within scenarios is that three of the four levels involve stochastic linkages of feasible interactions governed by probability functions. The top two levels activate variations within scenarios; which require tasks to be performed under a set of conditions. The third link converts tasks into practical implementation constructs called operational capabilities. The fourth linkage translates these into viable combinations of operational entities called force elements.

69. The horizontal analysis calculates the cumulative impact of activating several concurrent scenarios to assess the risk of shortages.

70. SOCRAM force elements represent those forces directly employed in response to scenarios. Force generation and attrition allowances must be factored into an asset mix before it is converted into any specific force structure. Current plans do not call for SOCRAM to incorporate a complete force structure analysis into the application because of the complexity it would impose.

SCENARIO RELATIONSHIPS TO TASKS



Slide 28 : Trial Scenario Relationships To Tasks

71. The SOCRAM trial was based on three scenarios (S3, S7, S9) activating low and high variations, each. Tasks were limited to OP1 Operational Mobility because its sub-tasks have readily available data. The trial yielded the table shown in the Figure.

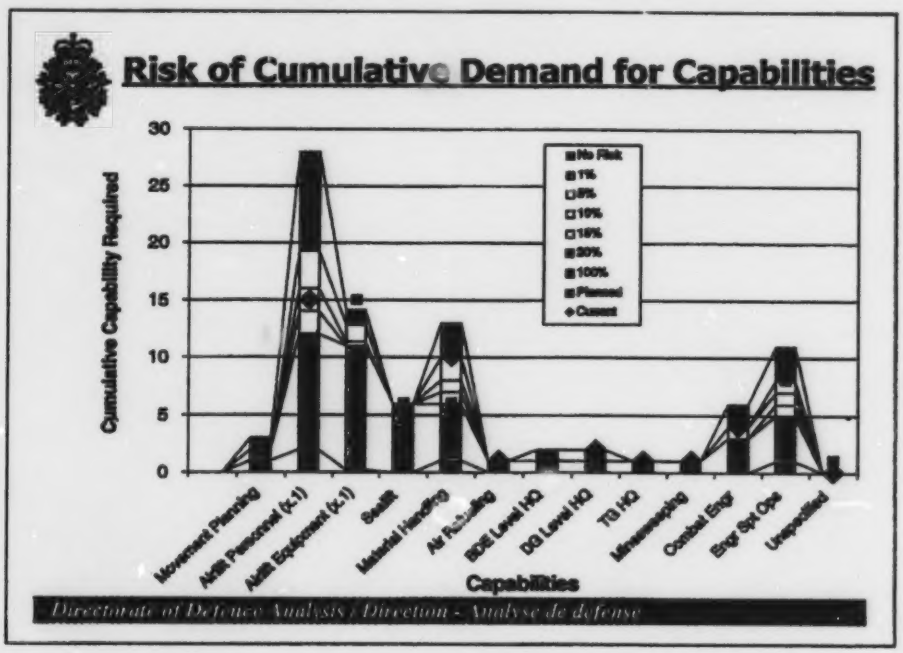
72. **Critical Movement Factors.** The most critical demand was invoked by the Scenario 3 high-end variation due to its limited deployment period even though Scenario 9 had the greatest total demand. At the same time, sealift economies of scale are only invoked in Scenario 9 because of the short response period in Scenario 3 and the Scenario 7 location

within Canada. The trial demonstrated how sensitive results are to scenario assumptions. This reinforces the view that the scenarios should be treated as representative examples of possible operations.

73. **Task Metrics.** Many tasks lack obvious metrics but their impact on capability demand can be scaled in relative terms once the problem is bounded between its high and low variations. (The trial variations above with green cells are the ones with the lowest demand.)

74. **Relating Tasks to Capabilities.** In theory each task and condition represents a distinct capability but the reality is that several tasks often call up the same capability at different times (e.g. deployment and recovery). In these cases the associated cells display a zero and note which task portrays the demand.

CUMULATIVE DEMAND FOR CAPABILITIES



Slide 29 : Risk Of Cumulative Demand For Capabilities

75. The bulk of the SOCRAM simulation effort is to determine which scenario, variation, and task combinations to activate; it is then a simple case to accumulate capability

combinations into a table that articulates the nature of the cumulative demand. These data are used to assess the risk (i.e. percentage of time) a given level of demand is exceeded. Metrics of each capability are specified independently.

76. Once the cumulative demand and risks are calculated the simplest way to portray it is a graph of the results. The trial results clearly illustrate that each capability exhibits a unique distribution of demand and risk. As well, the cumulative demand cannot be compared between capabilities because of the lack of a common metric. A minimum level of 1% risk was also imposed because of the limited simulation sample of 1000 iterations.

77. It should be noted that SOCRAM already incorporates two key mechanisms to facilitate a full-scale analysis that were not activated for this trial. The first involves assessing the collateral use of daily operations to provide offsets to each scenario and thereby reduce the net demand. The second involves a special feature that can be invoked to ensure all scenario and variation permutations are activated at least once.

78. The graphical analysis is based on detailed simulation output data that can be referenced to determine exact risk values. Because of this, it is quite feasible to display the values as a continuous curve or spectrum of colour. Unfortunately, the software application available for the trial limited the graphs to a few bands of risk and this eliminates our ability to interpolate between listed values except by referring to the detailed simulation data. The Trial explanations assume the functions are linear within each band of risk.

79. The Trial results raise several interesting observations. The first is that capability to "airlift personnel" had to be displayed at 1/10th its actual demand in order to increase the visibility of the other capabilities. The result is that its minimum demand (i.e. risk of 100%) is 20 because every variation uses at least this amount while 20% of the time the demand is 120 units. The risk is reduced to 15% with 140 units, to 10% risk with 160 units and 5% risk with 193 units. "Eliminating" the risk requires a capability level of 280 units.

80. Once the risk functions have been calculated, it is a simple matter to compare them to the current and planned levels of capability. The current and planned capability levels shown in the Figure are entirely hypothetical and are for demonstration purposes only.

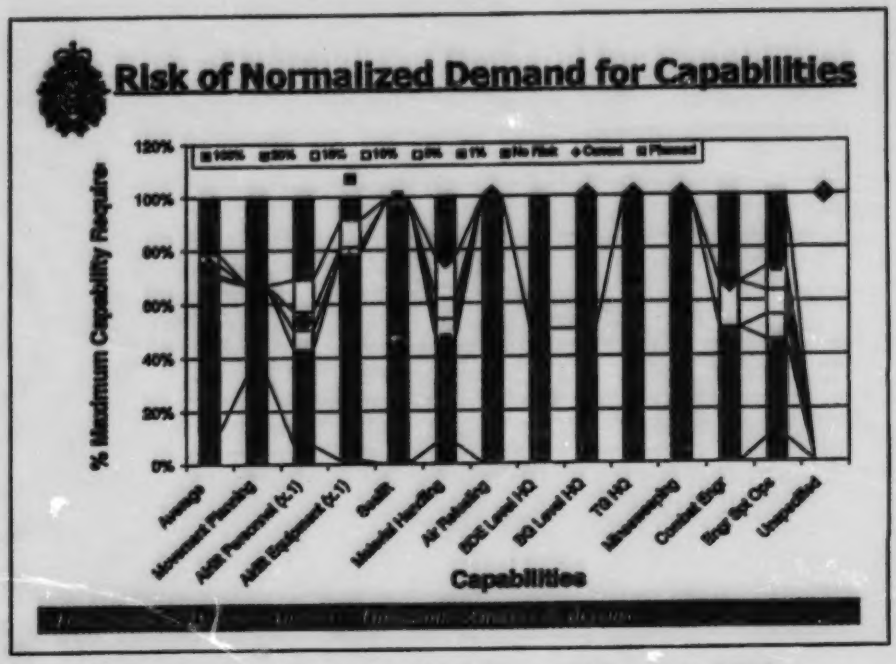
81. In the case of "airlift of personnel", the current level of 150 units has an associated risk that approximates to 17% (assuming linearity) and the planned addition of 100 more units reduces the risk to approximately 2%.

82. The "airlift of personnel" capability example demonstrates how capability gaps and risk characteristics can be identified and resolved. The graph confirms that most capability adjustments will narrow the gaps using this logical approach. One example is the case of the "unspecified" capability in which the lack of demand is illustrated in a way that supports the plan to eliminate the capability.

83. There can be cases where planned capability adjustments turn out to be counterproductive because of the manner in which they are misapplied. For instance, the airlift of equipment capability is a situation where the hypothetical plan calls for the addition of more units than the maximum demand justifies. Meanwhile, the "material handling" draws down its assets by 40% and in so doing increases its risk from 5% to 20%.

84. While it is simple enough to specify a nominal value for each capability demanded, it is much harder to set a practical value for either the current or planned capabilities. The simple fact is that capabilities are much easier to specify in relative terms than the evidence would support in absolute terms.

NORMALIZED DEMAND FOR CAPABILITIES



Slide 30 : Risk Of Normalized Demand For Capabilities

85. As noted previously, the cumulative capability demand graph provides a concise overview of each capability's impact and risk. However it lacks a common scale for comparisons between capabilities and therefore precludes any easy assessment of how resources can be optimally allocated.

86. The only viable way to facilitate this function is to "normalize" the demands through the use of a common metric. Unfortunately, the list of feasible "equivalent units" is limited because the capabilities involved cover such a wide span of possibilities. A purely artificial equivalent unit can be conceived but it would lack a sensible explanation to support its use. The only practical common metric uncovered so far occurs when we convert a capability's demand to a percentage of its maximum cumulative demand (i.e. when risk is eliminated). The resulting percentage of demand is a dimensionless metric that is conceptually simple to grasp and implement.

87. A significant advantage to using this normalized percentage is that it also provides a practical framework for the optimal re-alignment of capabilities. One approach to

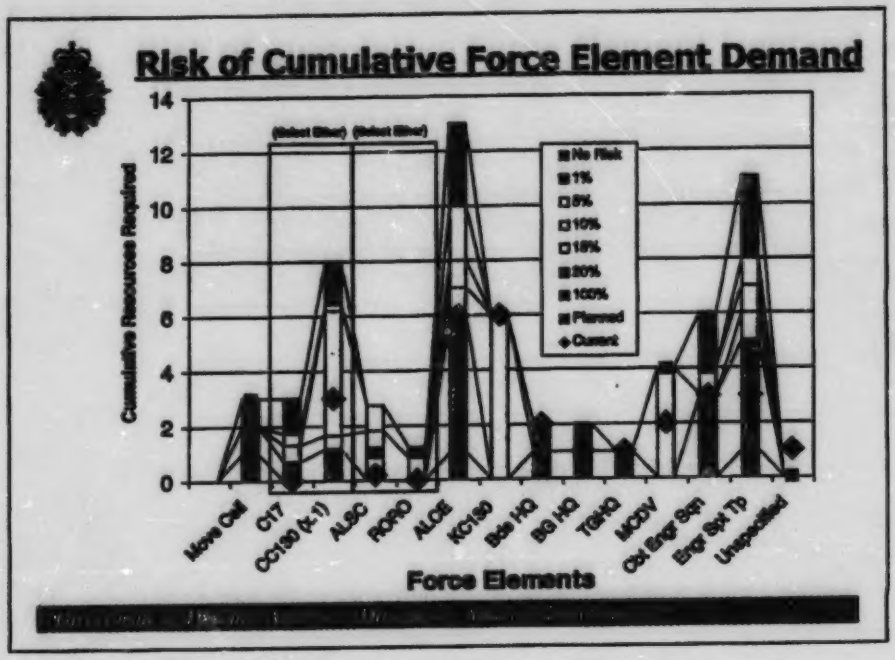
optimizing the capability inventory would be to adjust capability levels until they all reach the same associated risk (risk balancing). SOCRAM results in the form of normalized distributions facilitate utilizing this approach to capability optimization.

88. Dissecting the Trial data using normalized capability demand produces a much clearer idea of how the individual capabilities compare with each other, allowing logical courses of action to be identified. First off, the use of normalized demand makes it feasible to calculate the overall average cumulative demand and asset disposition. In this example, the arithmetic average of current assets is 74% of the total normalized capability requirement and this imposes about 12% risk (assuming linearity). The planned changes improve the normalized capability to 85% and in doing so reduce the risk to about 3%. Note that averaging caps an asset's contribution at 100% because exceeding the maximum demand clearly has no added utility.

89. Each capability's level of risk is in proportion with the amount displayed on the previous cumulative demand graph. What the normalized demand provides is clear and concise evidence as to which capabilities have the largest divergences from the others or the 100% capability. The Trial results, based on hypothetical data, show that the "sealift" capability currently has the most risk (approximately 50%). The current capabilities with the next level of risk are "airlift of equipment" and "engineering support operations" at about 30% risk each. The planned changes in assets will transfer the title of "least contributing capability" to "material handling" with 20% risk. The "unspecified" capability is automatically satisfied because it has no demand.

90. The normalized demand graph clearly shows how the lack of sufficient current assets is a systemic problem because most capabilities have a risk of severe shortages. The planned capability adjustments address many of these shortcomings. The planned "material handling" capability affects most of the gains by imposing a planned adjustment increases its risk. The result is a singularly strong bottleneck. If "material handling" were to retain its current capability state instead of being reduced, the overall risk level would drop from 20% to 5%.

CUMULATIVE FORCE ELEMENT DEMAND



Slide 31 : Risk Of Cumulative Force Element Demand

91. Specification of capabilities in conceptual terms is useful but ultimately the capabilities must be related to implementation articles and plans (equipment). The conversion of capability to force elements regroups the capability in terms that planners can work with.

92. The resulting cumulative force element demand graph, shown in this Figure, is very similar to that seen in the capability version. In fact, the explanations used to illustrate capability issues hold equally well for force elements and will not be repeated here. That said, there are three major differences between the two versions of the graphs. First, the number of distinct force elements that are tracked will be greater because each capability can be implemented by one or more force elements. Second, the total cumulative demand can easily become very large if a few force elements are used across several variations. Finally, force options allow force element alternatives to be displayed side-by-side to highlight their different demand characteristics.

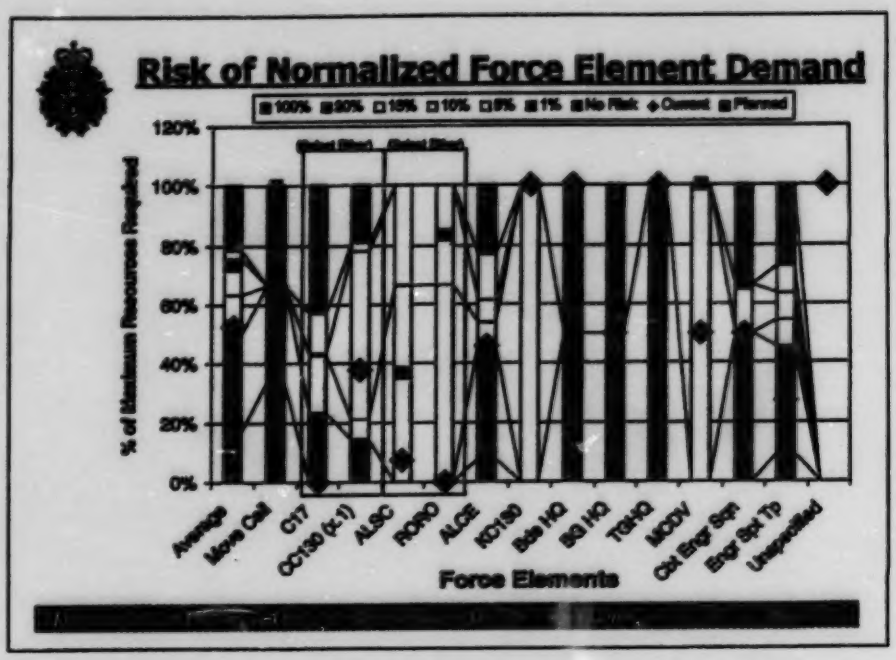
93. Examining the force element Trial results, it is seen that force elements interact distinctly from capabilities. The most obvious change is that multiple capabilities may coexist in a single force element. For example, both the "airlift of personnel" and "airlift of equipment" capabilities exist in a single force element such as the C17 or C130. At first glance this ability of a force element to fulfil multiple capabilities appears to allow it to address several demands at once. The reality is that each unit of a force element can only be employed in one place at a time. The result is that in most cases an activated multi-purpose force element uses only a few of its multiple capabilities at any given time.

94. The import of this is that multi-purpose force elements do not necessarily translate into reduced cumulative demands over specialized force elements. Multiple capability force elements do have a distinct advantage over more specialized ones when they are employed in a multiple threat environments where they can utilize several capabilities simultaneously. The other case occurs when there are few, if any, concurrent events that call for the same force element.

95. The other obvious advantage of the force element graph is that it can be used to compare the feasibility of viable alternatives generated by force options. In the Trial, the C17 and C130 aircraft (as well as the ALSC and RORO ship) force element options represent an either/or situation in which each one is accounted for separately but both are shown together so they can be compared against each other. The Trial results illustrate that the limited capacity of the C130 imposes a maximum cumulative demand of 80 aircraft whereas only three C17s are needed to perform the same tasks. Note that the disparity in actual numbers may be due to the scaling factors or input values used. That said, there is an even more striking difference in distribution of risk associated with each. The vast bulk of the C130 demand is linked to the concurrent activation of multiple high-end variations whereas the C17's large capacity means it is virtually impervious to variation size.

96. The result of these three factors is that while some force element demands are easy to visualize, most of the force element data tends to be squashed together. All this reinforces the utility of a normalized demand graph to assess force element impact and risks.

NORMALIZED FORCE ELEMENT DEMAND

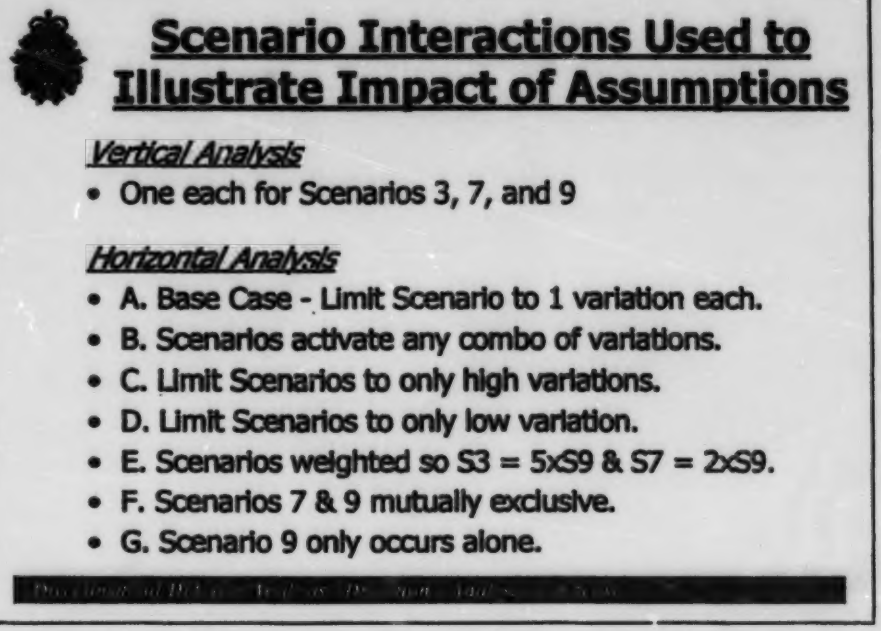


Slide 32 : Risk Of Normalized Force Element Demand

97. The normalized force element demand graph clearly illustrates how current shortfalls are localized in a few force elements. The actual relationships are the same as the cumulative demand graph but they were not properly portrayed because of the small quantity of demand compared to the large-scale force elements. The graph, shown in the Figure, clearly illustrates that the most significant current shortfall for a force element with existing capacity (i.e. not C17 or RORO) is "engineering support operations" at approximately 50% risk followed by several others that have 20% risk.

98. The most important implication of the normalized force element demand graph is that it provides unambiguous insights into the relative importance of force elements spanning widely dissimilar capabilities. On the basis of the available information and experience it is highly recommended that all analyses (be they vertical, horizontal or sensitivity) limit their reporting of results to force elements. In cases where capabilities must be discussed, the results should eliminate any mention of current or planned capability assets until such time that the validity and reliability of capability constructs have been more thoroughly demonstrated.

SCENARIO SENSITIVITY ANALYSIS


Scenario Interactions Used to Illustrate Impact of Assumptions
Vertical Analysis
• One each for Scenarios 3, 7, and 9
Horizontal Analysis
• A. Base Case - Limit Scenario to 1 variation each.
• B. Scenarios activate any combo of variations.
• C. Limit Scenarios to only high variations.
• D. Limit Scenarios to only low variation.
• E. Scenarios weighted so S3 = 5xS9 & S7 = 2xS9.
• F. Scenarios 7 & 9 mutually exclusive.
• G. Scenario 9 only occurs alone.

Slide 33 : Scenario Interactions Used To Illustrate Assumptions

99. The analysis previously described produces useful insights under a specific set of assumptions. To ensure that a robust solution or capability development plan has been identified, the effectiveness of the proposed solution needs to be tested against possible changes in the planning assumptions. The sensitivity analysis conducted as part of the Trial consisted of the following cases:

A. Base Case - Limit Scenario to 1 variation each.

B. Scenarios activate any combo of variations.

C. Limit Scenarios to only high variations.

D. Limit Scenarios to only low variation.

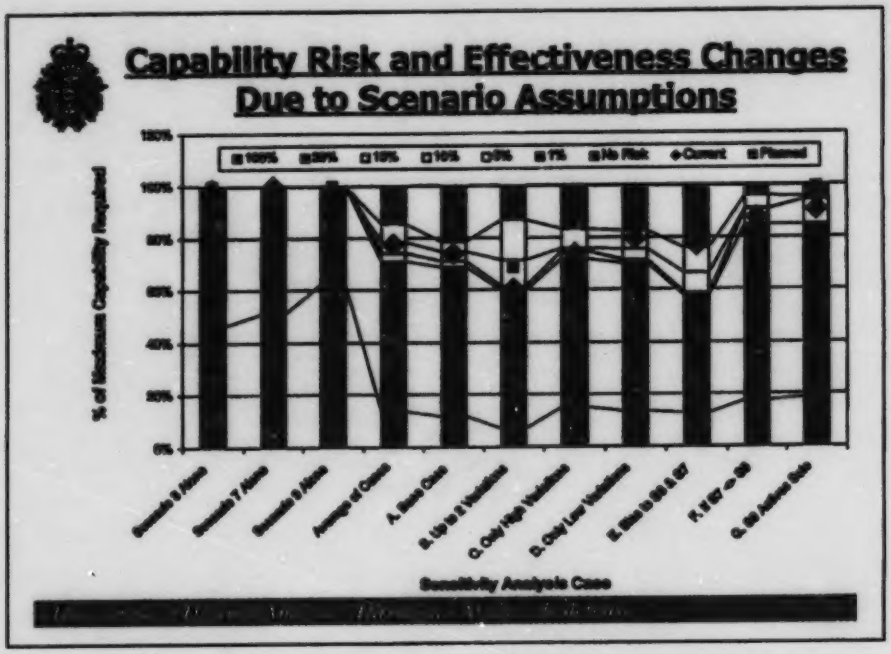
E. Scenarios weighted so S3 = 5xS9 and S7 = 2xS9.

F. Scenarios 7 & 9 mutually exclusive.

G. Scenario 9 occurs alone, no other concurrent operations permitted when Scenario 9 is activated.

100. The goal of cases C to G was to impose activation assumptions that limit the combination variations more than either case A or B. All SOCRAM inputs other than the above parameters were left unchanged across all cases.

CAPABILITY RESULTS FROM SENSITIVITY ANALYSIS



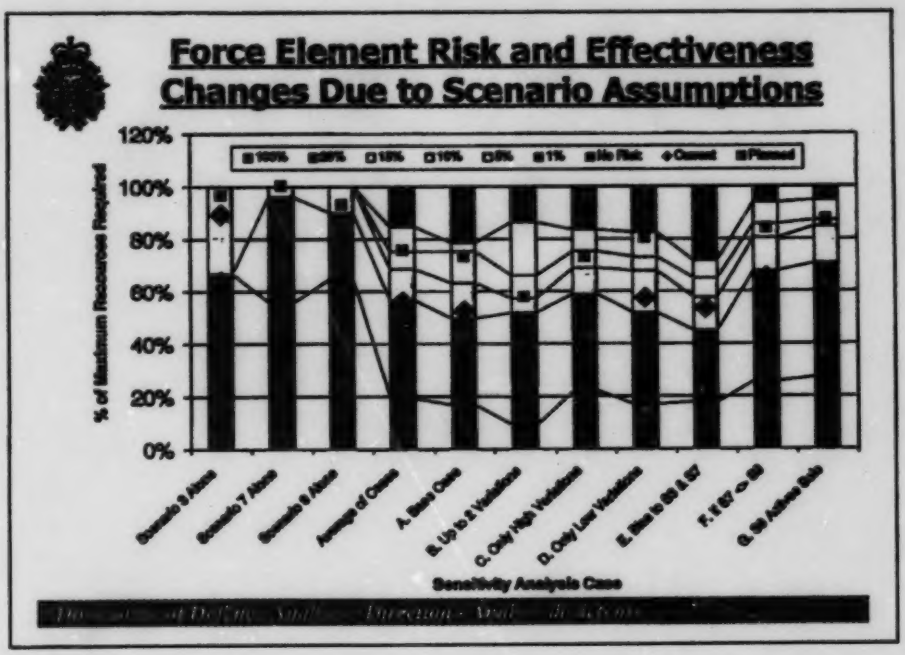
Slide 34 : Capability Risk And Effectiveness Changes

101. The vertical risk analysis is displayed for each of the three scenarios alone, followed by the concurrence analysis (average of all the cases plus each case). The results are displayed as capability risk and effectiveness using the averaged normalised demand from each analysis to provide an overview of how the distribution of demand varies. Note that each bar is produced from a thorough analysis and can be supported with detailed graphs as discussed earlier.

102. The first important observation is that a small change in the activation assumptions inevitably produces a noticeable change in the demanded capability. This confirms the original hypothesis that activation assumptions can be a major factor in assessing the mix of capabilities demanded.

103. The second observation is that increases in the number and/or diversity of variations produce a requirement for greater percentage of capability to handle the rarely occurring events. As examples, Case B involves more combinations of variations than the other cases and Case E invokes scenario 9 in relatively few iterations than do the other cases.

FORCE ELEMENT RESULTS FROM SENSITIVITY ANALYSIS



Slide 35 : Force Element Risk And Effectiveness

104. The results of the sensitivity analysis for risk related to force element levels and the impact on effectiveness is displayed in the Figure above. The force element graph has the same basic characteristics as the capability analysis chart displayed previously and those basic comments also apply here.

105. The major difference between the two sensitivity analysis graphs is that the force elements graph more clearly illustrates demands associated with low levels of risk. This occurs because each force element tends to fulfil a portion of a capability requirement. This acts as a multiplier during concurrent activities and the effect is to stretch out the high end of the demand curve.

106. The Trial experience confirms that it is much easier to quantify force elements and relate these to current/planned asset values. This occurs because force elements are relatively tactile entities while capability constructs are more difficult to quantify in absolute terms.

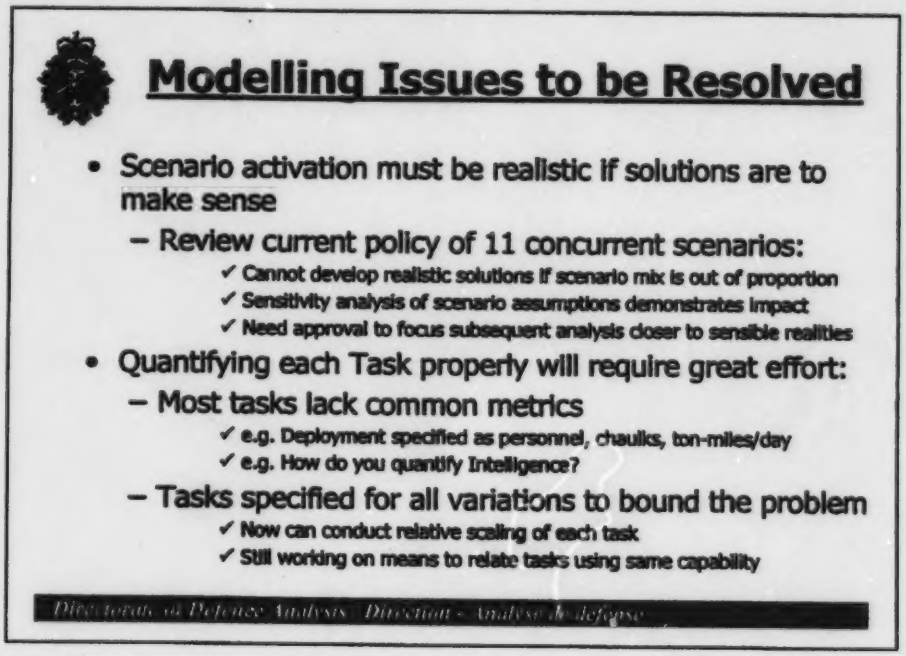
107. In order to demonstrate the utility of the sensitivity analysis in specific terms, it is worthwhile to summarise the key observations of the vertical and horizontal sensitivity analyses. The results appear straightforward, but the impact of each was not obvious at the start:

- Scenario 3 alone. Small risk traced to significant shortage in high-end variation capability demand for "airlift equipment". Low-end variations are not an issue.
- Scenario 7 alone. Significant risk traced to small shortage in both variations' availability of "engineering support troop" force elements.
- Scenario 9 alone. Bottleneck traced to shortage in variations' "sealift" capability and availability of "engineering support troop" force elements.
- Average of Cases. Calculated average of Cases A to G. The column acts as a handy standard to gauge the relative bias of the following cases.
- Case A. (Base Case) - Limit Scenarios to 1 variation each. Equal emphasis on all combinations implemented, to assess viability of variation bounds. Major risks arise from diversity of demand, cumulative effect of concurrent effort and lack of resources.
- Case B. Scenarios activate any combo of variations. Illustrates how activating multiple variations per scenario impacts on demand. Not realistic except in specific cases (such as SAR) where activation of multiple variations is well understood and fully appreciated.
- Case C. Limit Scenarios to only high variations. Illustrates how acceptance of higher demand assumptions can consistently overwhelm assets.
- Case D. Limit Scenarios to only low variation. Illustrates how lower demand is more consistently aligned with current and planned asset mix.
- Case E. Scenarios weighted so S3 = 5xS9 and S7 = 2xS9. Illustrates how risk is lowered when the focus is on low demand from S3. Confirms suspicion that demand bottlenecks are mostly linked to S7 and S9.

- Case F. Scenarios 7 & 9 mutually exclusive. Illustrates how reduced demand and risk results from eliminating the interaction of two large demands.

- Case G. Scenario 9 only. Illustrates the case where S9 invokes priority over other scenarios. Continued shortfall highlights the fact that the available assets are insufficient to handle this individual case.

MODELLING ISSUES


Modelling Issues to be Resolved
• Scenario activation must be realistic if solutions are to make sense
– Review current policy of 11 concurrent scenarios:
✓ Cannot develop realistic solutions if scenario mix is out of proportion
✓ Sensitivity analysis of scenario assumptions demonstrates impact
✓ Need approval to focus subsequent analysis closer to sensible realities
• Quantifying each Task properly will require great effort:
– Most tasks lack common metrics
✓ e.g. Deployment specified as personnel, chaulks, ton-miles/day
✓ e.g. How do you quantify Intelligence?
– Tasks specified for all variations to bound the problem
✓ Now can conduct relative scaling of each task
✓ Still working on means to relate tasks using same capability

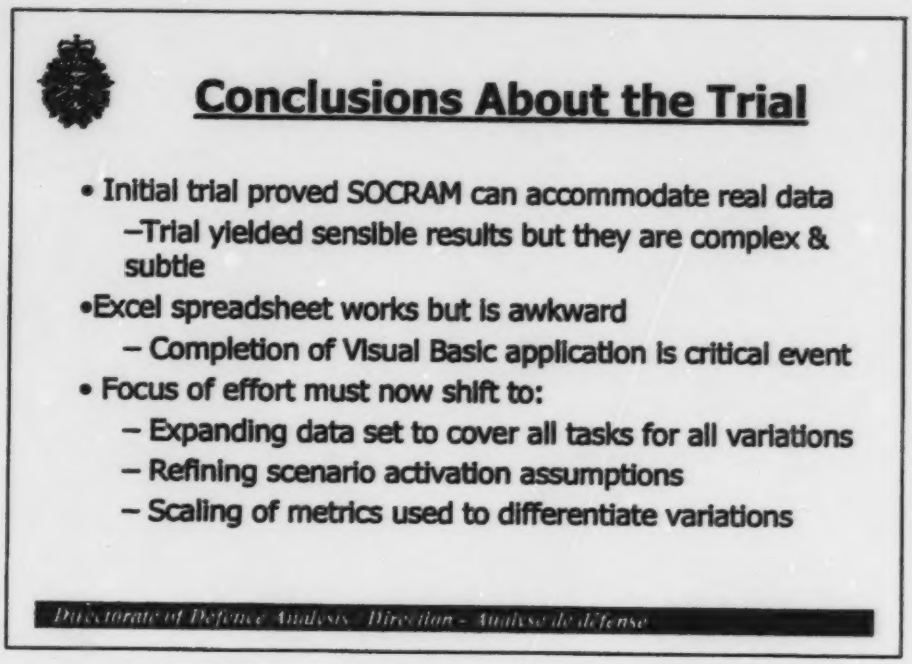
Slide 36 : Modelling Issues To Be Resolved

108. Two major modelling issues that came out of the Trial must be addressed before the next level of analysis can be undertaken.

109. The key to ensuring that the solutions make sense will be in refining and scaling how scenarios are activated. The Trial's sensitivity analysis demonstrated that small adjustments can produce a large change in the mix of assets that are required. This is important because the current planning assumption of unlimited concurrent scenarios appears to impose a cumulative demand that goes far beyond what existing or planned capabilities can realistically support. A full analysis will be conducted but to be valid and reliable it needs to explore and obtain consensus on realistic and sensible activation assumptions.

110. Each task will have to be definitively quantified and this is expected to require a great deal of analysis effort. The duration of this is uncertain because most tasks being quantified lack an accepted or definitive metric. For example, how does one go about quantifying levels of "intelligence" support? Some preliminary work has been done listing the tasks for two variations of each scenario and then specifying which variations in the group are the least and most demanding in terms of the CF resources. Work is underway to produce a relative scaling of each task's demand between variations and then relate the tasks that call up the same capability.

CONCLUSIONS REGARDING SOCRAM


Conclusions About the Trial
• Initial trial proved SOCRAM can accommodate real data
–Trial yielded sensible results but they are complex & subtle
•Excel spreadsheet works but is awkward
– Completion of Visual Basic application is critical event
• Focus of effort must now shift to:
– Expanding data set to cover all tasks for all variations
– Refining scenario activation assumptions
– Scaling of metrics used to differentiate variations
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Slide 37 : Conclusions About The Trial

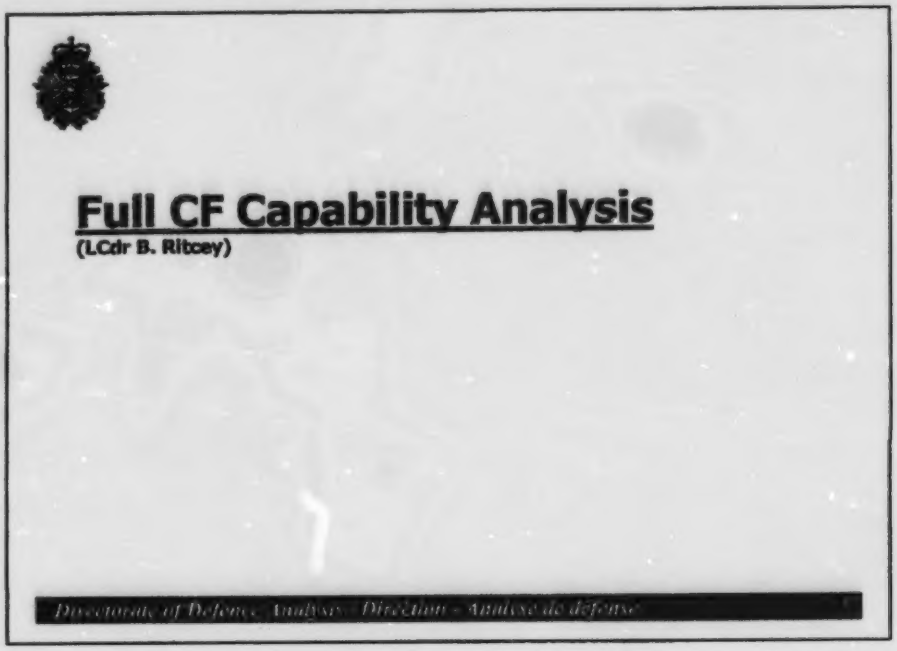
111. The SOCRAM results from the Trial demonstrate that the initial test was successful and prove that SOCRAM is capable of accommodating a real set of data. The Trial results are sensible and consistent but they are complex and subtle. Because of this it is essential that any quantitative results always be accompanied by detailed explanations to ensure the analysis is properly interpreted.

112. The Excel spreadsheet works as advertised and its flexibility was a key feature that allowed the Trial to quickly adapt to new aspects of the problem. That said, past experience suggests that maintaining the data in the Excel format will become progressively more awkward over the long term so the completion of the Visual Basic version of SOCRAM is deemed a critical requirement. A Summer Research Assistant (SRA) currently assigned is expected to deliver a working version for testing by the end of August. The application will be developed further during the fall to ensure it can be fully implemented.

113. The focus of effort will now shift to completing the implementation of the full-scale problem. The first step will be the expansion of the data set to quantify all tasks for all

variations. Next, the scenario activation assumptions must be carefully assessed and validated. Lastly, significant effort will be needed to refine the scaling metrics to ensure they realistically differentiate demand between variations.

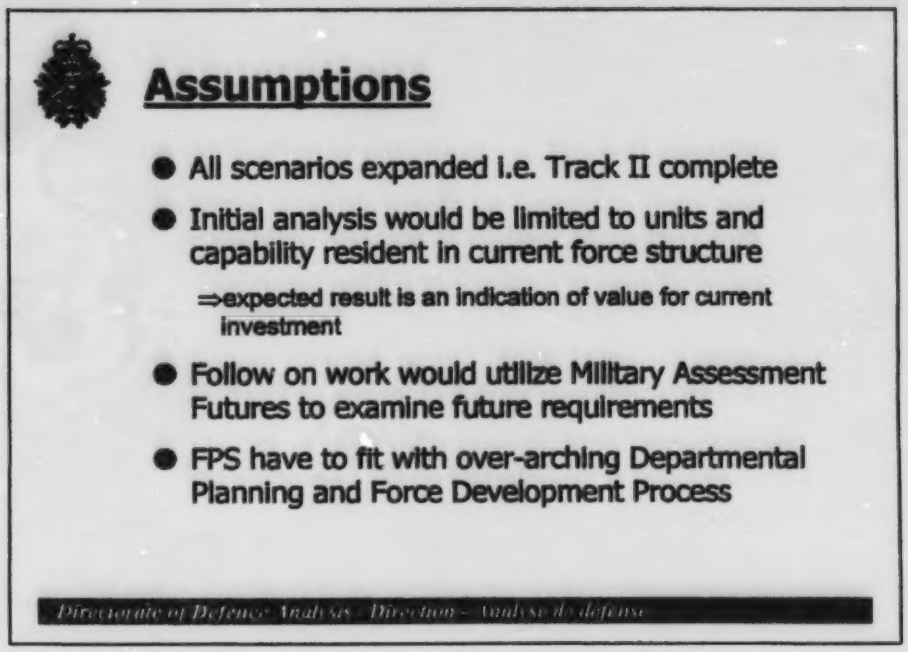
FULL CF CAPABILITY ANALYSIS



Slide 38 : Full Cf Capability Analysis

114. The previous parts of the briefing have been concerned with scenario development and the results of the Proof-of-Concept Trial. This part of the briefing is concerned with the analysis of the remaining scenarios to complete a full assessment of CF capability requirements; i.e. where do we go from here.

ASSUMPTIONS FOR CF CAPABILITY ANALYSIS


Assumptions
All scenarios expanded i.e. Track II complete
Initial analysis would be limited to units and capability resident in current force structure
⇒expected result is an indication of value for current investment
Follow on work would utilize Military Assessment Futures to examine future requirements
FPS have to fit with over-arching Departmental Planning and Force Development Process
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Slide 39 : Assumptions For Capability Analysis

115. In exploring how a full CF capability assessment could be conducted and what would be involved, four assumptions were made:

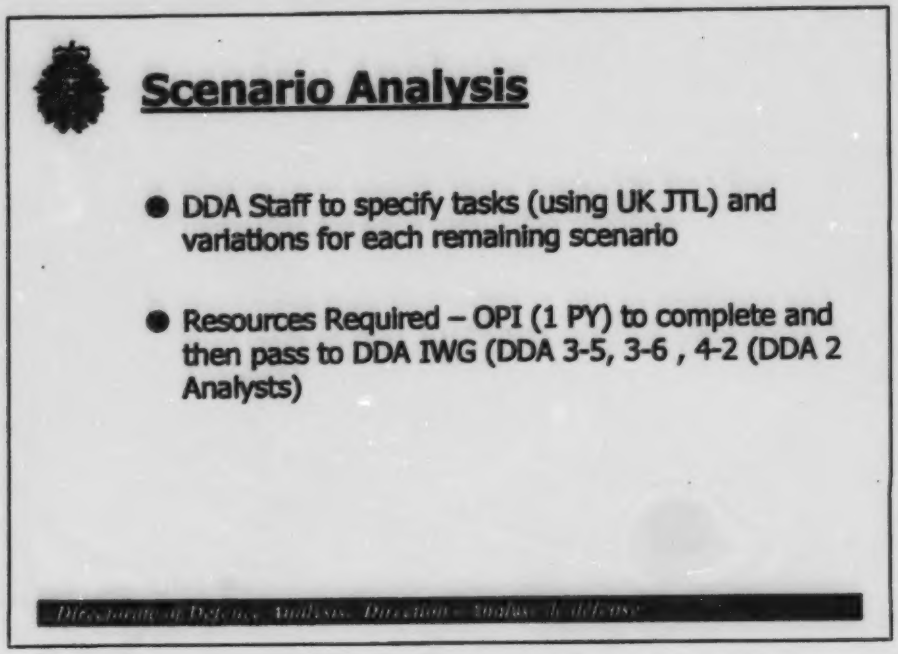
a. Obviously validated data are needed before the analysis can be completed; however, detailed analysis can take place concurrently using available data.

b. DDA's trials and tribulations over the last 6-8 months have indicated that capability analysis is difficult and time consuming. Initial analysis is limited to the capability available in our current force structure i.e. the DART (Disaster Assistance Response Team), a Task Group, an Air Force Wing etc. There are two benefits to this approach. It should introduce a comfort factor with respect to the SOCRAM model because the results are intuitive. Secondly, the data will provide an indication of the value obtained from the current CF force structure.

c. Follow-on work will determine capabilities for a future force structure and thus will require "out of the box" thinking.

d. As with all Strategic level issues this project has to fit within the developing Defence Planning Force Development process.

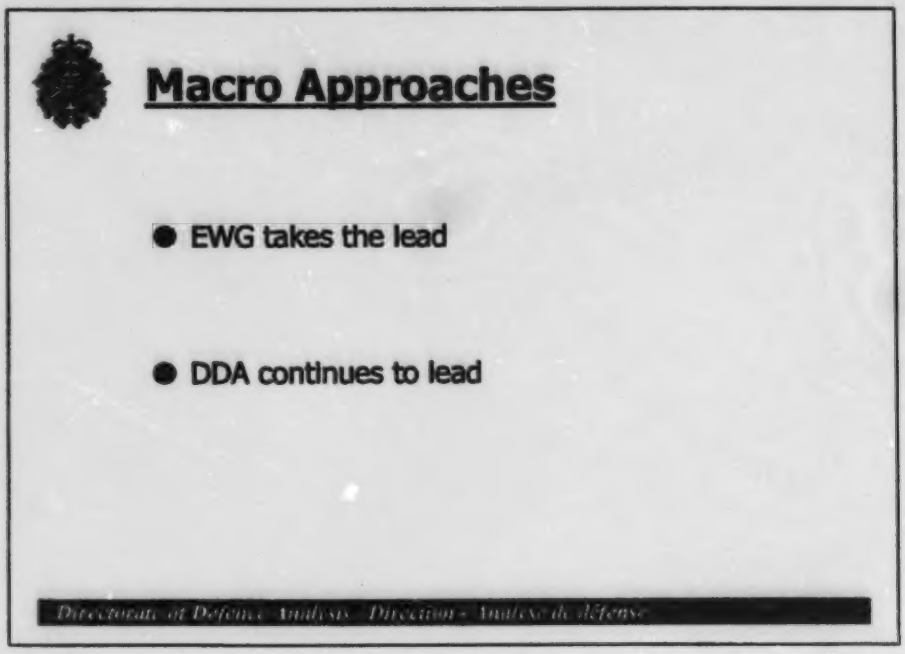
SCENARIO ANALYSIS


Scenario Analysis
DDA Staff to specify tasks (using UK JTL) and variations for each remaining scenario
Resources Required – OPI (1 PY) to complete and then pass to DDA IWG (DDA 3-5, 3-6 , 4-2 (DDA 2 Analysts)

Slide 40 : Scenario Analysis

116. Regardless of the approach taken to conduct the follow-on analysis, DDA staff will specify tasks by using the UK(/CA) JTL. High - Low CF contribution variations will be derived for each scenario. DDA 3 has agreed to assign one desk officer to be the OPI for the issue on essentially a full time basis.

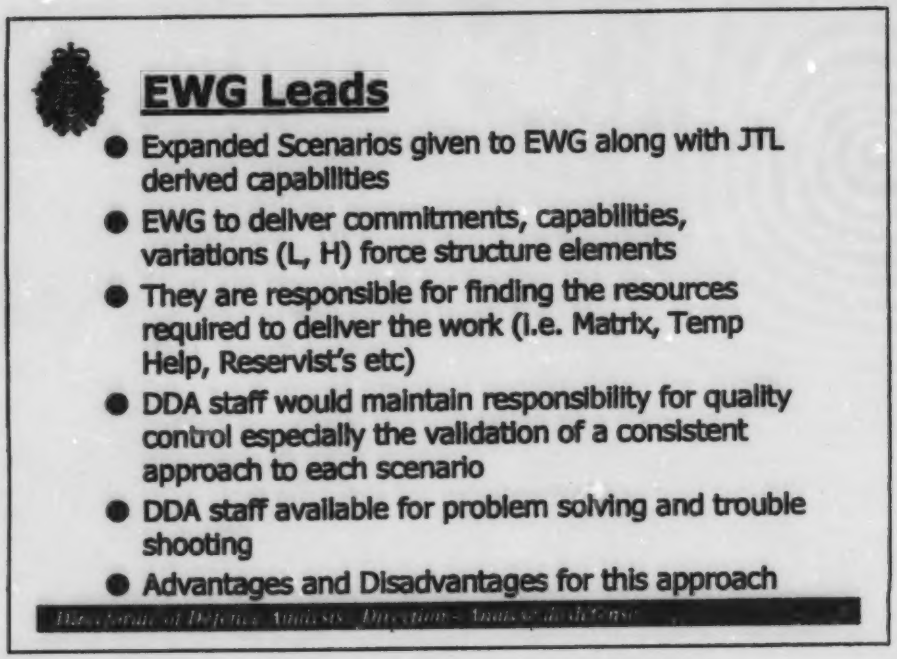
POSSIBLE APPROACHES


Macro Approaches
EWG takes the lead
DDA continues to lead
Directorate of Defence Analysis Direction - Analyse de la défense

Slide 41 : Macro Approaches

117. Two macro approaches have been identified. One approach would be to have the External Working Group take control of the process and lead the analysis. The other approach would have DDA continue to lead the analysis using the EWG for input and results validation. The pros and cons of each approach will be discussed and a recommendation for the Way Ahead will be made.

EXTERNAL WORKING GROUP (EWG) LEADS


EWG Leads
Expanded Scenarios given to EWG along with JTL derived capabilities
EWG to deliver commitments, capabilities, variations (L, H) force structure elements
They are responsible for finding the resources required to deliver the work (i.e. Matrix, Temp Help, Reservist's etc)
DDA staff would maintain responsibility for quality control especially the validation of a consistent approach to each scenario
DDA staff available for problem solving and trouble shooting
Advantages and Disadvantages for this approach

Slide 42 : External Working Group (EWG) Leads

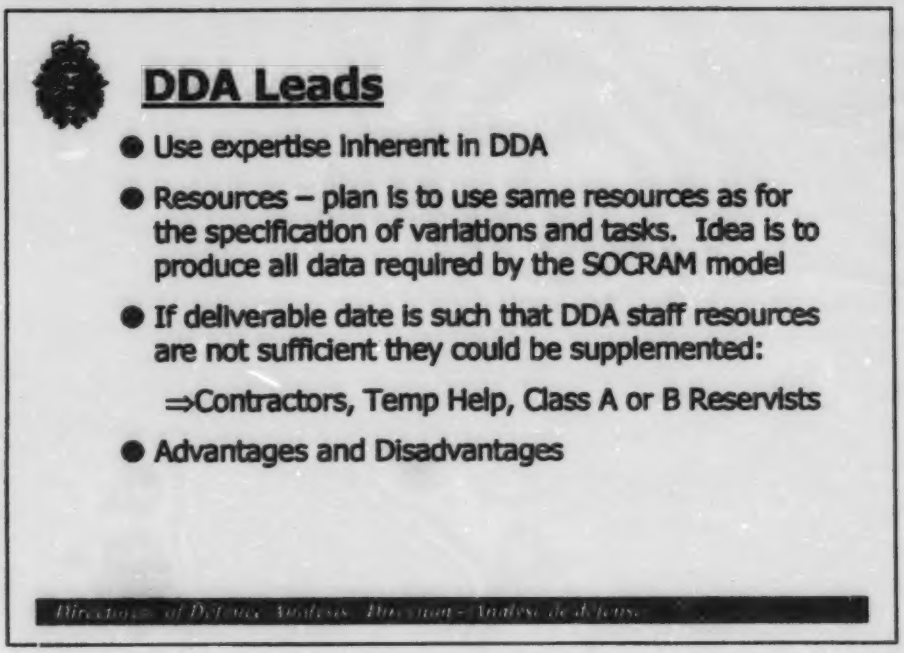
118. If the EWG were to take the lead for the full CF analysis, DDA would provide the Group with the expanded scenarios and the JTL derived capabilities. It would then be up to the EWG to develop the high and low variations for each scenario and specify the associated tasks, capabilities and force elements. The Group would be responsible to find resources required to support the analysis and set the schedule for the study. DDA would retain responsibility for quality control and would provide guidance to the Group on the use of the tools and interpreting the details of the scenarios.

119. An advantage of this approach is that it eliminates any notion of the FPS project having a central staff bias. It would be up to the EWG to ensure that the input data required for the analysis was valid and unbiased.

120. If experience with the expansion of the Snapshots is an indication of the level of support that can be consistently committed from outside DGSP, this approach will take a considerable amount of time. A crude estimate of the time required would be approximately three weeks per scenario with a half time commitment from the key members of the EWG

plus one week for DDA validation. With this rate of progress, the analysis would take approximately (4 weeks x 8 scenarios) 32 weeks of effort.

DDA LEADS


DDA Leads
● Use expertise inherent in DDA
● Resources – plan is to use same resources as for the specification of variations and tasks. Idea is to produce all data required by the SOCRAM model
● If deliverable date is such that DDA staff resources are not sufficient they could be supplemented:
⇒Contractors, Temp Help, Class A or B Reservists
● Advantages and Disadvantages

Slide 43 : DDA Leads

121. If DDA continues to lead the analysis effort, the expertise that has been built over the course of the Proof-of-Concept Trial can be directly utilized. The same resources that were involved in preparing the data for the Trial would be used to do the same for the remaining scenarios.

122. If available resources become an unacceptable bottleneck in the schedule, additional outside augmentation could be considered. When considering outside assistance, it should be noted that DDA's experience in using this approach to expand the Snapshots has shown that finding the right individuals with the needed skill sets can be difficult.

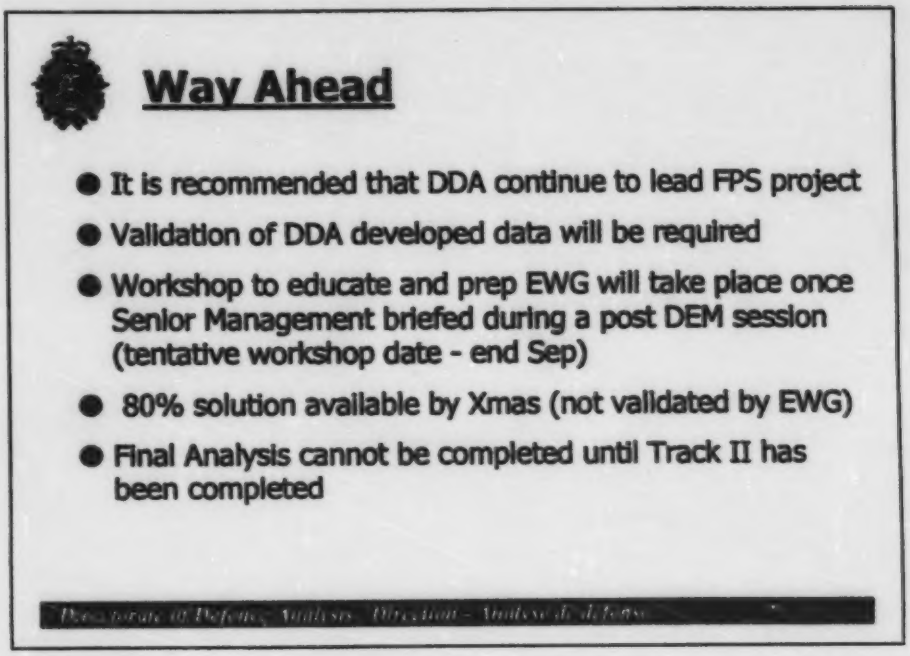
123. An advantage to this approach would be that a small team with previous experience would concentrate on producing the needed input data. This should allow the first draft of the data and the results to be produced much quicker than if it were done by a large group of diverse representatives without previous experience or detailed understanding of the

analysis models. Time would still be required for the EWG to review the input data and validate the results. Overall, DDA/DGSP would have better control over the timetable for the analysis.

124. One of the disadvantages to this approach would be that a significant number of DDA/DGSP resources would be committed for a significant amount of time. Higher priority incremental taskings, which have been common in the past, could disrupt the planned schedule and impose unforeseen delays in completing the analysis.

125. This approach would still require some support outside of DDA as the DDA analysis team would not possess logistics expertise, nor fighter ops experience, etc. DDA would have to rely on expertise in other organizations, possibly members of the EWG, to supply the necessary information needed to complete the scenario input data sets for analysis.

RECOMMENDED WAY AHEAD


Way Ahead
It is recommended that DDA continue to lead FPS project
Validation of DDA developed data will be required
Workshop to educate and prep EWG will take place once Senior Management briefed during a post DEM session (tentative workshop date - end Sep)
80% solution available by Xmas (not validated by EWG)
Final Analysis cannot be completed until Track II has been completed

Slide 44 : Way Ahead

126. Having considered the two approaches, DDA's recommendation is to continue the project with DDA in the lead.

127. The effort could begin with a workshop. The workshop would be used to explain to the EWG what DDA has developed for the Scenario Framework and what was obtained from the Proof-of-Concept Trial. This first step would be essential to get the buy-in of the EWG.

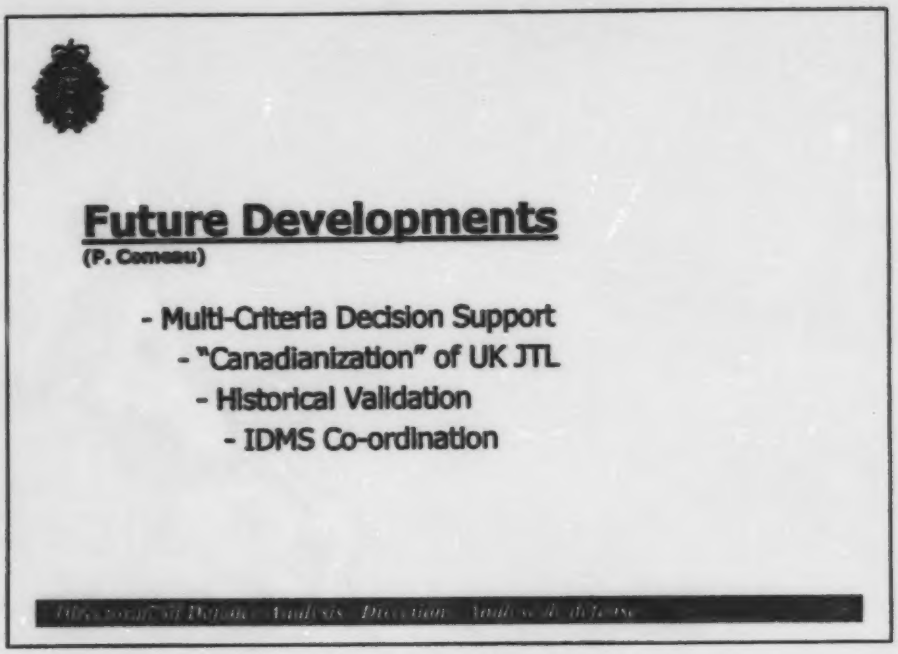
128. The workshop would also allow the EWG to be trained in the use of a JTL and understand how DDA determined the data requirements for SOCRAM. If time permitted, the Group could start validating the scenarios.

129. Notwithstanding the workshop, some of the scenarios will have to be sent out for secretarial review, modification and approval.

130. A tentative schedule, in the absence of incremental taskings, would see all scenarios having a DDA completed analysis (but they would not all be validated by the EWG) by the end of the calendar year. The EWG review and refinement could be quite lengthy and

extensive. In any case, the full analysis could not be completed until all the scenarios have been expanded.

FUTURE DEVELOPMENTS

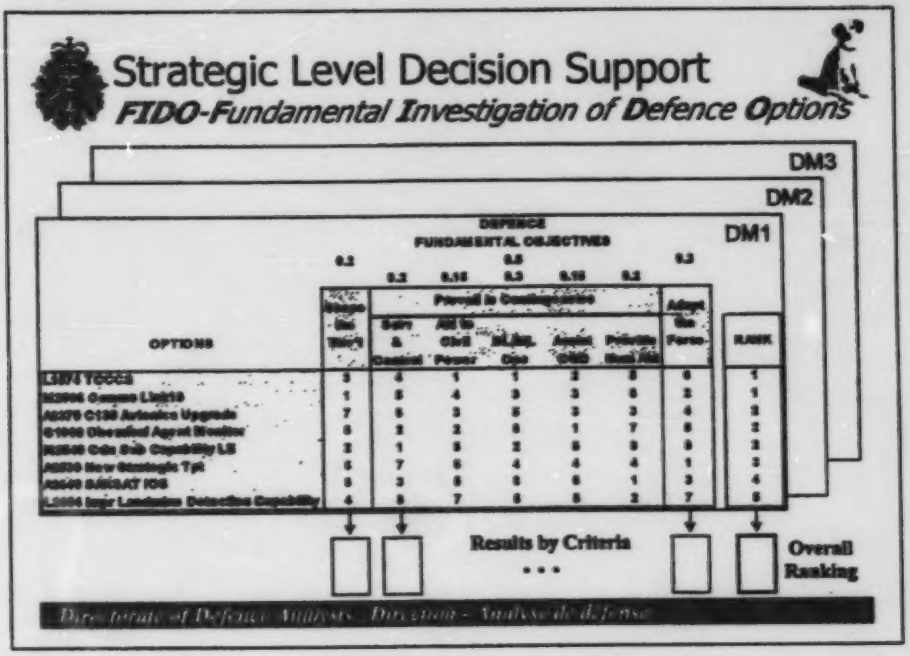


Slide 45 : Future Developments

131. As a follow-on to the first scenario Trial, there are many areas that have been explored in the application of scenarios for long term defence planning. Some are available now or on short notice, others will require some effort.

132. The Framework is nearing completion, recognized as a first edition of version. It is seen as a basic model that can provide the Department with useful rudimentary information to support force planning. Many enhancements are possible and should be examined in time. Some of these possible extensions will be discussed now.

STRATEGIC LEVEL DECISION SUPPORT



Slide 46 : Fundamental Investigation Of Defence Options (FIDO)

133. The first possible development is strategic decision support for consensus building.

134. Scenarios can be directly applied to strategic level decisions. Each defence objective has one or more representative scenarios defined. Force development alternatives can then be tested through the scenarios "wind tunnel".

135. Using Keeney's Value Focused Thinking approach - which focuses on fundamental value objectives instead of means objectives, a simple decision model called FIDO-Fundamental Investigation of Defence Options- is being developed. As can seen in the Figure, the data set can be small but comprehensive. It captures possibly complex value judgements including intangibles, over multiple conflicting criteria.

136. This example shows a set of options ranked by many stakeholders according to defence fundamental objectives: To Shape the Environment, To Prevail in Contingencies, and To be a Strategically Adaptable Force in the long term. Any decision criteria can be used

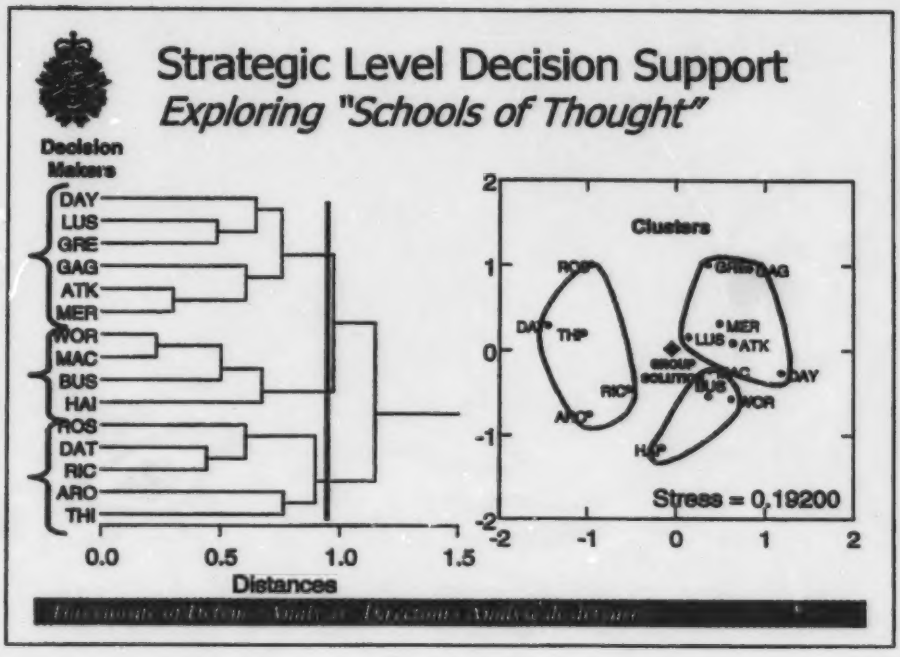
- including Strategy 2020; scenarios provide the context to assess options (ie the reality check) according to basic value objectives.

137. Given the relative importance of fundamental criteria, the ranking most consistent with the individual group member rankings is quickly found. Note that this procedure is not based on weighted average scores, which is often used by some staff and can generate false or biased results.

138. Any set of alternatives could be considered, including strategic force structure options, force development projects (as shown in the Figure), or even contenders for a particular project.

139. Benefits of this approach includes a start point for developing better alternatives, articulating decisions based on fundamental value objectives, and structuring strategic conversations among stakeholders. Data and results can be saved for later review facilitating strategic planning continuity.

EXPLORING "SCHOOLS OF THOUGHT"



Slide 47 : Exploring "Schools Of Thought"

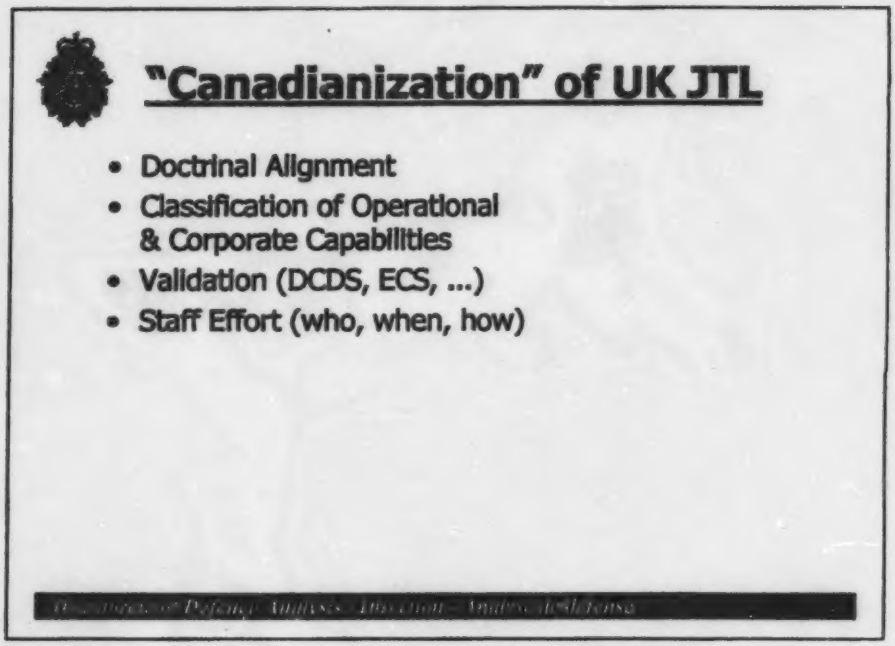
140. With important and difficult choices based on high degrees of uncertainty, typical of defence planning, it is important to fully understand stakeholder positions in terms of any group solution being proposed based on consensus. The assumption is that the views of so-called "dissenters" can add value and insight in illuminating and understanding the basic problem and thereby improve the decision-making process.

141. On the left is a tree showing "how far apart" 15 stakeholders are in terms of their preferred option rankings. They can then be grouped together in clusters to form so-called "Schools of Thought". At a given "distance" shown on the left by the vertical line, three clusters are formed on the right, which can then be compared to the group solution. Cluster solutions can then be explored. Levels of consensus can be measured. Areas requiring further study can be identified.

142. Note that the reported 19% "stress value" is a measure of least distortion achieved as a result of mathematically reducing the multi-dimensional ranking data to a two-dimensional chart. Anything under 20% is considered acceptable

143. This type of analysis provides a starting point for dialogue about any overall solution and more importantly can help to determine if the strategic decision criteria are complete, well understood, and assumptions are unambiguous. Billions are invested in military capabilities, it is important to take the time to understand the choices.

"CANADIANIZATION" OF JOINT TASK LIST


"Canadianization" of UK JTL
• Doctrinal Alignment
• Classification of Operational & Corporate Capabilities
• Validation (DCDS, ECS, ...)
• Staff Effort (who, when, how)

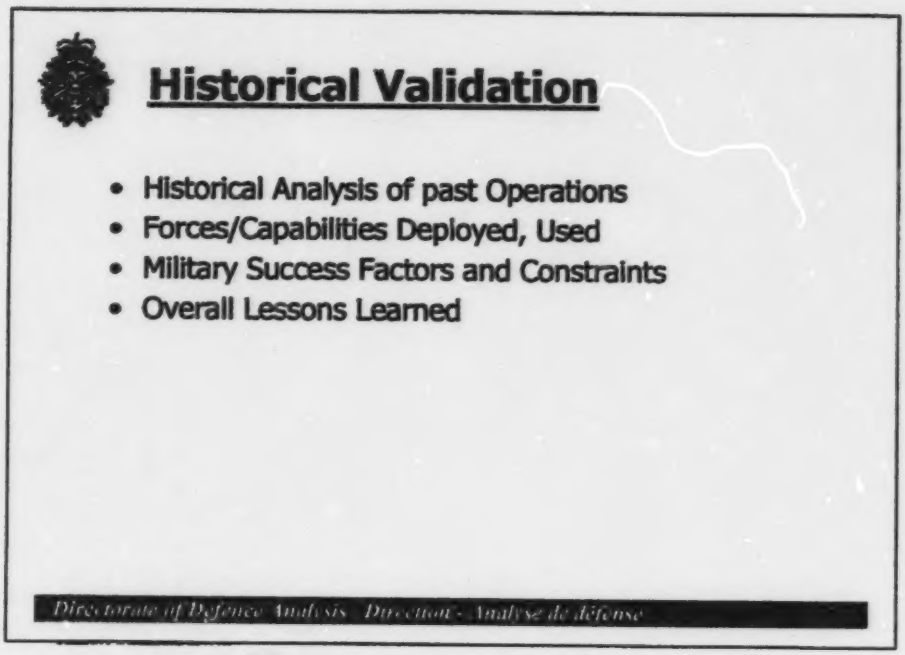
Slide 48 : "Canadianization" Of UKJTL

144. In order to manage its capabilities, the CF needs its own fully developed comprehensive joint capability structure/catalogue and lexicon. The importance of clear definitions cannot be understated. The UK JTL goes a long way to providing a solution but there is some work to be done to "Canadianize" it by providing:

- consistent alignment with doctrine,
- validation of a proposed CF JTL including DCDS and ECS staff and
- identification of candidate capability generators and classification of operational and corporate capabilities.

145. Although an initial start on a CF JTL was carried out by DCDS staff, more staff effort will be required to complete this work. Direction will be required as to who will do this, when is it feasible to be completed given on-going activities, and how this will be done. Two options include parallel/concurrent Capability Component (CC) reviews and integration of inputs or a central staff proposal with follow-on CC review. Either option will require significant but essential army, navy and air force involvement.

HISTORICAL VALIDATION


Historical Validation
• Historical Analysis of past Operations
• Forces/Capabilities Deployed, Used
• Military Success Factors and Constraints
• Overall Lessons Learned
Directorate of Defence Analysis Direction - Analyse de défense

Slide 49 : Historical Validation

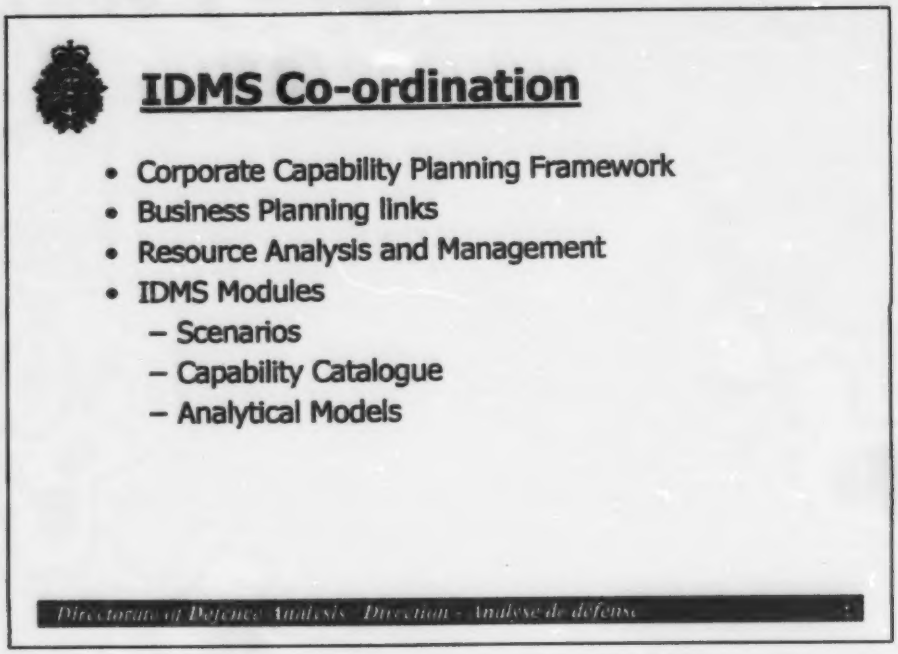
146. While scenarios as a tool for exploring the future has been explained, there is also much to learn from the past. DDA is prepared to initiate an academic review of CF involvement in operations. This historical analysis could be done in collaboration with the academic community, thereby maintaining and strengthening our links with external institutions.

147. The analysis, which could be broad and/or in-depth, could take stock of forces and capabilities recently deployed and used as well as military success factors and significant constraints experienced as a result of political/military or environmental conditions

encountered or through limitation in capabilities. The end product of this type of historical analysis could be to extract overall lessons learned, which should be considered in planning future capabilities for military operations.

148. This exercise will also provide some data on scenario activation that can be used to guilde the concurrence analysis.

INTEGRATED DEFENCE MANAGEMENT SYSTEM (IDMS)


IDMS Co-ordination
• Corporate Capability Planning Framework
• Business Planning links
• Resource Analysis and Management
• IDMS Modules
– Scenarios
– Capability Catalogue
– Analytical Models
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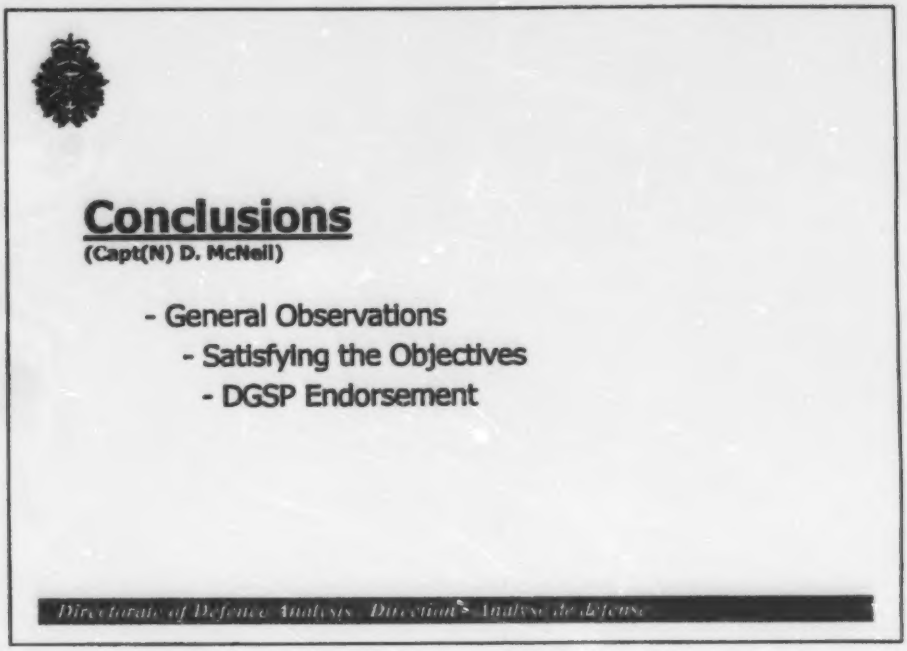
Slide 50 : Integrated Defence Management System (IDMS) Co-Ordination

149. The Integrated Defence Management System (IDMS) is moving ahead as the corporate management framework. So far DDA and the IDMS team have been sharing information on each other's task and see the potential in many areas to co-ordinate efforts.

150. As part of the scenario framework, a significant amount of work has been done in linking strategy to outputs through capabilities in a systematic way. The scenario framework can provide context for analysis and decision making about defence capabilities - one of the aims of the IDMS. The scenario framework will assist in managing defence capabilities. There must, however, be a link made to resources to determine affordability, which is stated as a main component of the IDMS. There is clearly a potential for data sharing and exchange.

151. In the long term, it might be possible to have the Scenarios, the capability catalogue and even certain analytical models as modules of the IDMS.

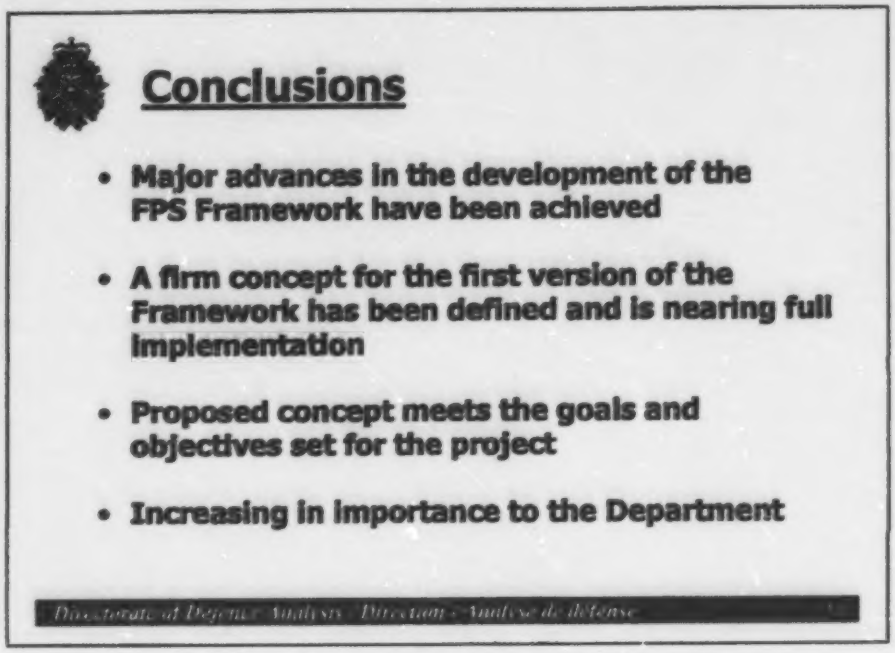
CLOSING REMARKS



Slide 51 : Conclusions

152. To close off the briefing, a few concluding remarks should be made covering a general appreciation of what has been achieved thus far in developing the Scenario Framework, the success made in satisfying the original objectives set for the project and the endorsement sought from DGSP.

CONCLUSIONS


Conclusions
• Major advances in the development of the FPS Framework have been achieved
• A firm concept for the first version of the Framework has been defined and is nearing full implementation
• Proposed concept meets the goals and objectives set for the project
• Increasing in importance to the Department

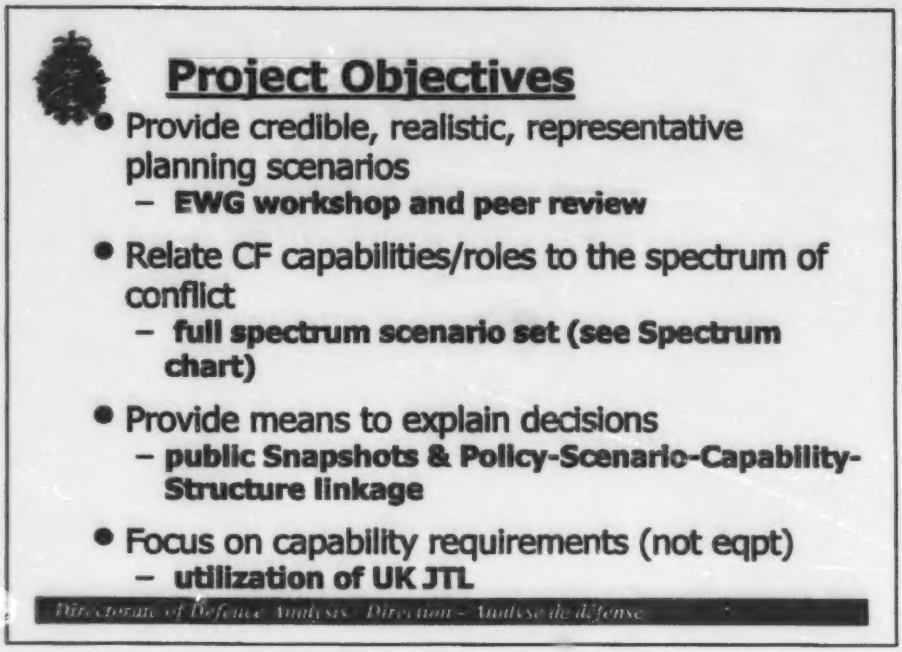
Slide 52 : Conclusions

153. To begin, it should be stated that DDA is very enthusiastic about what has been accomplished here. Major advances have been made. A first version of the Framework is nearing completion and should be very useful for Senior Management. It provides a working foundation upon which further enhancements can be made.

154. The concept that has been proposed satisfies all the goals and objectives that were set for the project. This will be elaborated on in a moment.

155. Lastly, from the comments made in various areas of the Department, it seems clear that this Framework is more important than ever to DND.

PROJECT OBJECTIVES SATISFIED


Project Objectives
Provide credible, realistic, representative planning scenarios
– EWG workshop and peer review
Relate CF capabilities/roles to the spectrum of conflict
– full spectrum scenario set (see Spectrum chart)
Provide means to explain decisions
– public Snapshots & Policy-Scenario-Capability-Structure linkage
Focus on capability requirements (not eqpt)
– utilization of UK JTL
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Slide 53 : Project Objectives

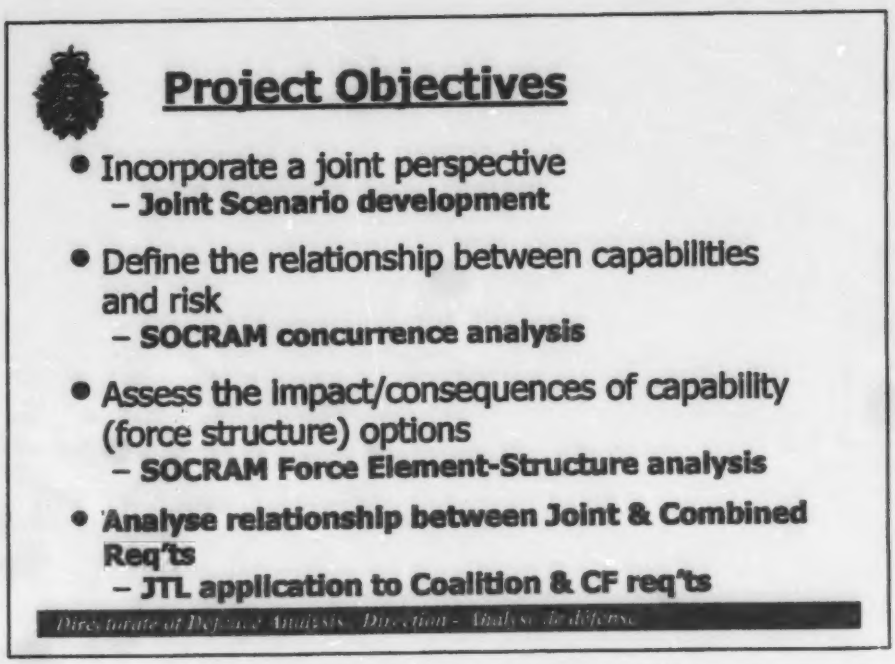
156. All the objectives set for the Scenario Framework have been satisfied:

- the development of a minimum set of realistic scenarios was achieved through the Scenario Workshop and EWG review process,

- relating CF capabilities to their employment across the spectrum of conflict was accomplished through a scenario set which spans the spectrum of conflict as shown in our Spectrum of Conflict chart which has been widely viewed,

- the specification of "public" scenario snapshots and the Framework linkage of Policy to Scenarios to Capability Requirements to Force Structure Elements provides a means to explain decisions to the Government and the general public,

- utilizing the Joint Task List allows us to concentrate on what must be accomplished and not on who and how it is done. The "How" follows later in the process,


Project Objectives
• Incorporate a joint perspective
– Joint Scenario development
• Define the relationship between capabilities and risk
– SOCRAM concurrence analysis
• Assess the impact/consequences of capability (force structure) options
– SOCRAM Force Element-Structure analysis
• Analyse relationship between Joint & Combined Req'ts
– JTL application to Coalition & CF req'ts

Slide 54 : Project Objectives (Cont'd)

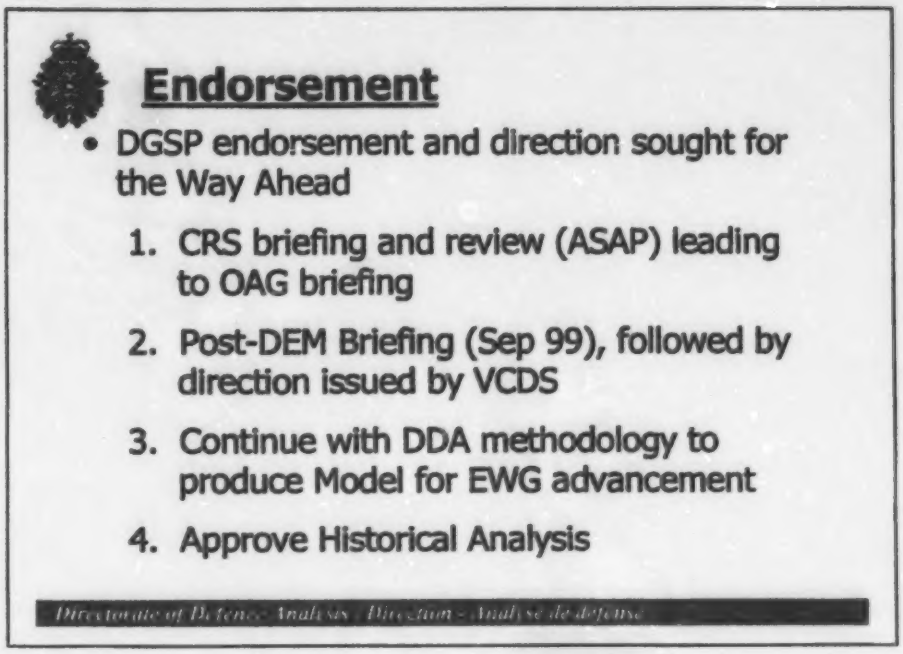
- a joint development effort ensured that a Joint perspective was maintained throughout the Scenario framework,

- identifying the relationship between capabilities and risk is the essence of the SOCRAM concurrence analysis,

- comparing requirements identified through the SOCRAM analysis with capability levels proposed in various force structure options supports the assessment of the impact and consequences of different capability (force structure) options and

- relating CF contributions to the Coalition requirements identified through the Joint Task List allows the relationship between Joint and Combined requirements to be examined.

ENDORSEMENT SOUGHT


Endorsement
• DGSP endorsement and direction sought for the Way Ahead
1. CRS briefing and review (ASAP) leading to OAG briefing
2. Post-DEM Briefing (Sep 99), followed by direction issued by VCDS
3. Continue with DDA methodology to produce Model for EWG advancement
4. Approve Historical Analysis
Directorate of Defence Analysis / Direction - Analyse de défense

Slide 55 : Endorsement Sought

157. Having shown what the DDA/EWG Team has accomplished in the development of a scenario-based capability planning framework, DDA is seeking DGSP endorsement for our proposed way ahead.

158. It is proposed that CRS staff be briefed as soon as possible to seek their views on how well the Framework meets the identified concerns and recommendations of the OAG. DDA would then be prepared to brief the OAG, at their request.

159. To incorporate the Framework within the Dept, a post-DEM briefing is suggested as soon as possible in September, followed by direction from the VCDS on how to utilize the Framework.

160. To complete this phase of the development of the Framework and conduct the first complete analysis, DDA will continue with development of the initial draft analysis followed by EWG refinement.

161. Finally, DDA proposes to initiate, through DDA's academic links, a historical analysis of CF employment in past operations similar to those specified in the Scenario Framework.

III - CONCLUSION

RECORD OF DECISIONS

162. The discussion that followed the briefing was very wide ranging, covering specific details of the effort to complete development of the Scenarios and the Framework to hypothetical applications of the analysis capability. During the discussion several key points were identified and endorsed by DGSP and the Directors present.

163. It was acknowledged that the development of the Force Planning Scenario (FPS) Framework has significantly advanced and should provide valuable support to decision-making in the Department. It is noted that the information provided by the Framework is only one component of many that are required for decision-making, however, the contribution of the Framework will be very useful.

164. The VCDS and CRS should be briefed on the FPS Framework as soon as possible. The option of briefing both parties at the same time should be investigated. An allocation of 90 minutes for the briefing should be sought.

165. The External Working Group (EWG) should be re-engaged with the project. The EWG should be briefed on the details of the Framework and proof-of-concept trial and their views/comments noted. Copies of the DGSP briefings should be provided in advance of the meeting as background material. The level of support the EWG can provide to the analysis process for the Framework must be assessed.

166. Following the briefings of the VCDS, CRS and EWG, a Post-DEM briefing on the FPS Framework should be conducted.

167. With respect to the development of the Scenario descriptions, the process will continue as planned. The set is expected to be complete and releasable towards the end of this calendar year or early New Year (assuming minimal Y2K impact). At that time, the set of scenario descriptions could be issued under authority of the VCDS to the ECS and Group Principals for final review and approval. It is noted that the scenario descriptions will continue to evolve as the strategic environment does.

168. It is recognized that the FPS Framework is a "work in progress". It will continue to be refined and enhanced as new and/or better capabilities can be incorporated.

169. DDA will utilize its academic links to undertake a historical review and analysis of CF employment in operations of the types represented in the FPS set. The contributions, roles and effectiveness of the CF in these operations will be assessed. The resultant information will support the development and validation of the data required to conduct the capability analysis with the FPS Framework.

SUBSQUENT EVENTS

170. The plan proposed by DDA, in mid July 1999, to initiate the application of the FPS Framework in analysing the capability requirements of the CF began with an effort to explain to the EWG the developments that have occurred since they were last briefed on the state of the Framework. Their views and comments would be noted and addressed, modifying the Framework as appropriate. The Framework would then be applied to analyse the current capability requirements of the CF and the ability of the current force structure to satisfy capability demand. With gaps and weakness of current structure identified, the focus would shift towards a timeframe 15 to 20 years ahead.

171. On 8 August 1999, the VCDS tasked DGSP (Ref. 8), along with the Environmental Chiefs of Staff and Group Principals, to produce a Strategic Capability Plan (SCP) to align strategic capabilities with anticipated financial postures over a 20-25 year period. A draft of the SCP would be available by end October 1999. This tasking had the effect of immediately advancing the Framework introduction to the latter phase of the DDA plan.

172. Given the timeframe for the SCP tasking, only selected components of the Framework would be utilized. As well, the working group for the SCP would comprise some members from the EWG along with members of concepts staff that had not been involved in the FPS Framework development.

173. The net effect of the SCP tasking was to advance the introduction of the FPS Framework into Department force planning and begin the process to institutionalize its employment. The tasking also diverted DDA resources required to complete the development of the Framework. So, the introduction would be accelerated, but completion of the Scenario descriptions and Framework analysis tools would be delayed.

174. On 13 September 1999, the VCDS was briefed on the FPS Framework. The briefing was a condensed version of the two briefings given to DGSP, covering the background to the project, the results of the Proof-of-Concept Trial and the Way Ahead. The VCDS endorsed

the achievements that had been accomplished and the Way Ahead, which was adjusted from that proposed to DGSP in light of the SCP tasking.

175. The VCDS directed that a post-DEM briefing be scheduled as soon as possible. An information briefing was presented to DEM on 21 September 1999.

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7. **Towards the Development of a Force Planning Framework for DND**, Christopher, G.L., Comeau, P., Funk, R.W., and Isbrandt, S., Director Operational Research (Joint & Land) Research Note RN 99XX, October 1999
8. Letter from the Vice Chief of Defence Staff, Canadian Forces, dated 8 August 1999

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One of the first tasks given to the Strategic Planning Operational Research Team (SPORT), upon its establishment in January 1997, was to lead the effort of the Directorate of Defence Analysis (DDA) to develop a scenario-based capability planning framework. This framework is commonly referred to as the Force Planning Scenario Framework. After consulting with Canada's major Allies, reviewing the literature and exploring possible methodologies, a concept for the framework was specified. A proof of concept trial was undertaken during the Spring of 1999. The status of the Force Planning Scenario Framework and the results of the proof-of-concept trial were reported to the Director General Strategic Planning (DGSP) in a series of two briefings. The first briefing took place on 28 June 1999 and covered the background of the project: the initiating factors, the goals and objectives of the project, the results of the concept exploration and the details of the proposed Framework concept. The second briefing, 14 July 1999, focussed on the results of the proof-of-concept trial and sought endorsement for the proposed Way Ahead.

This report covers the content of the second briefing given to DGSP, covering the results of the Framework trial. This report will serve as one of the documents recording the history and process of the development of the Force Planning Scenario Framework.

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